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The Indiana Enhanced I/M Program Evaporative Leak Inspection Study Phase I

Prepared for:

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Applied Analysis

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I. Summary

As part of its role as the contracted operator of the Indiana Vehicle Inspection/Maintenance (I/M) program managed by the Indiana Department of Environmental Management (IDEM), Envirotest Systems Corp (ESC) performed a study in partnership with IDEM to develop inspection procedure to identify vehicle fuel leaks.

The first phase, which is reported here, is a development and study phase during which test procedures were developed and refined in the inspection lanes at various stations. ESC recruited a sample of one hundred 1995 and older models that failed their exhaust emissions inspection for HC. These vehicles were examined by visual inspections and by HC sniffing devices to locate any evaporative emission leaks.

Findings

Evaporative emissions were detected on half of the vehicles that failed for exhaust HC. The IM93 test HC failure rate was 17.4% during the period. It is projected, therefore, that at least 8.7% of 1995 and older vehicles have evaporative emissions. This confirms that fuel and evaporative leaks are a significant source of pollution from older model vehicles.

77% of the leaks were either underhood or underbody. Vapor from these leaks is often swept towards the rear of the vehicle by the radiator fan or cooling cart fan and is likely to be part of the excess air entering the constant volume intake of the exhaust gas analyzer.

23% of the leaks were detected in the vicinity of the gas cap and filler neck.

The leak inspection was useful in diagnosing the source of HC on vehicles that had previously failed the exhaust emissions test – some repeatedly.

Public Reaction

Vehicle owners of failing vehicles responded positively to the offer of the additional evaporative inspection. During the study only one out of 100 customers declined the additional inspection. Customers stated they appreciated the extra efforts to address their vehicles hydrocarbon issues. Knowing that the inspection was voluntary the vast majority of customer choose to participate.

Deployment of Voluntary Leak Inspection

As a result of the study findings, ESC in conjunction with IDEM, will implement a voluntary leak inspection as an addition to the I/M program. Initially this will be limited to 1995 and older model vehicles that fail their exhaust HC test.

Follow-on Work

Proposed follow on work includes:

- Leak inspections of a random sample of 1995 and older vehicles that pass the IM93 HC exhaust inspection. This will indicate if leak inspection of these vehicles is a cost effective option.
- Leak inspections of a random sample of OBD vehicles. This will indicate the frequency of evaporative leaks in 10-11 year old vehicles. OBD-II evaporative monitoring systems should identify many evaporative system leaks but are not expected to detect liquid fuel leaks.
- Quantification of emissions leaks.
- Analysis of inspection results from voluntary program.
- Follow-up and reporting on repairs performed on vehicles with evaporative emissions.

II. Description of the Leak Inspection Study

A. Introduction

ESC proposed to develop and implement procedures for identifying vehicles with fuel leaks as part of the Clean Air Car Check program. Vehicles leaking gasoline are a major contributor to the emission of volatile organic compounds (VOC), and correcting leaks through a leak inspection program could significantly reduce the amount of VOC emission.

The fuel leak inspection program is being developed in partnership with IDEM. Implementation of the leak inspections is proceding in two phases:

- Phase 1 was a development and study phase during which the test procedures were developed and refined in the inspection lanes at individual stations.
- Phase 2 includes the implementation of GLL inspection in all IM93 inspection lanes in the Clean Air Car Check program.

This report describes the results of Phase I whose principle goals were to:

- Develop the test and refine the lane screening procedures and software
- Establish methods of quantifying and/or classifying the leaks found
- Refine the leak inspection processes
- Develop operating procedures for the leak inspection program

During Phase 1, ESC implemented inspection lane screening and leak inspections at the Griffith, Gary, and Hammond stations in conjunction with the Repair Advisor program to expand access to previous IM93 test HC fails. Recruitment was limited to 1995 and older vehicles since newer models do not have an exhaust inspection. One hundred vehicles that failed their exhaust inspection for HC were recruited. ESC also ran trials with simulated leaks on a test vehicle and investigated alternative leak detection methods.

ESC investigated using the existing IM93 equipment to automatically screen vehicles during the transient exhaust test. Selected vehicles were recruited for follow-up inspection using special equipment and visual examination. All results were advisory.

Following sections describe the Phase I activities and results in more detail, including:

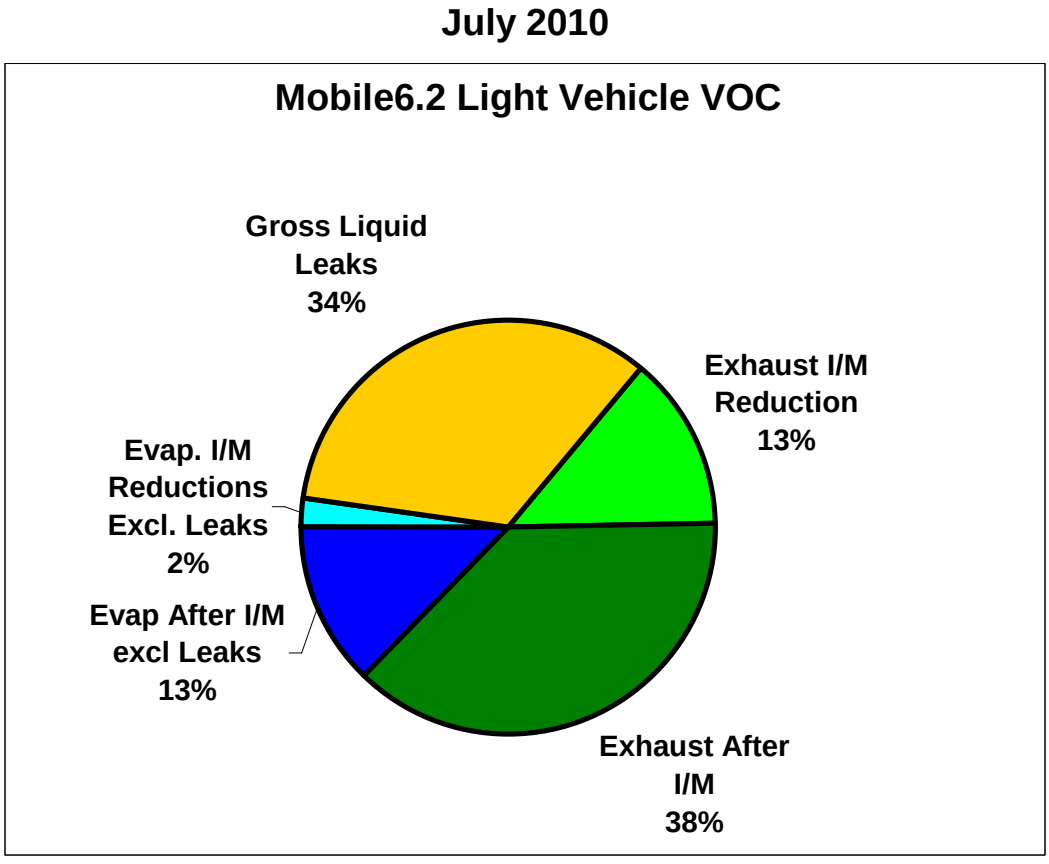
- Background on evaporative and liquid fuel leaks
- Using transient test equipment to screen for evaporative and liquid leaks
- Special equipment and visual inspection procedures
- Vehicles recruited and study results

B. Evaporative and Liquid Fuel Leaks

The EPA emissions model, Mobile6.2, projects evaporative VOC emissions are approximately the same magnitude as exhaust VOC emissions in 2007 for light duty vehicles. Evaporative emissions increase substantially during high temperature episodes that are often associated with high ozone levels.

The definition of evaporative emissions in the Mobile6.2 model includes hydrocarbons leaking from a vehicle as well as the escape of gasoline vapor. The Mobile6.2 model projects leaks from vehicles defined as having a Gross Liquid Leak (GLLs) to be 70% of the evaporative emissions inventory or 40% of total VOC. Reducing liquid leaks could have a significant positive impact on VOC reduction. California recently started visual inspections for leaks and is also introducing a fuel tank low-pressure test.

Figure II-1: Mobile 6.2 Projected Percentages of Light Gasoline Vehicle VOC



Excludes evaporative refueling losses.

Studies[1,2,3,4,5,6,7].. have found that a small percentage of vehicles have leaks but they have a large impact on total VOC emissions. Leaks were found to occur more frequently in vehicles over ten years old and EPA assumes in the Mobile6.2 model design[8,9,10,11,12,13,14,15] that the

frequency of leaks will be reduced in OBD equipped vehicles because of better materials and durability. However, current OBD system designs do not have the ability to detect many of the liquid leaks that occur.

Although vehicles with fuel leaks are fairly easy to identify, EPA has not yet defined inspection procedures and the Mobile6.2 model does not contain any I/M design commands to estimate emissions reductions from the inspection and repair of liquid leaks.

Definition of Gross Liquid Leak Vehicles

The Mobile6 design document M6.EVP.006 defines a category of vehicles having substantial leaks of liquid gasoline (as opposed to simply vapor leaks). These vehicles were labeled gross liquid leakers (GLLs). EPA used the following three definitions to define such vehicles based on the evaporative emissions test used:

- Resting loss emissions, i.e., the mean emissions during the last six hours of the 24-hour RTD test, of at least 2.0 grams per hour, or
- Hot soak test emissions of at least 10.0 grams per one hour test, or
- Running loss test emissions of at least 7.0 grams per mile over a LA-4 driving cycle or 137.2 grams per hour.

Compared to typical exhaust emission rates, GLLs VOC emissions are large. Liquid leaks can originate from a number of points on a vehicle. The Mobile6 design document EVP.004 describes liquid fuel leaks from fuel systems that can result in very high hot soak emissions, e.g. fuel injectors leaking due to damage or incorrect position, carbureted fuel systems with leaking carburetor gaskets or a defective fuel shut off at the carburetor bowl. Other sources reported in Coordinating Research Council studies identified leaks from fuel pumps, fuel tanks and tank connections. Many GLLs are readily detectable either visually or by odor.

C. Using Transient Test Equipment to Screen for GLLs.

ESC investigated whether the second-by-second IM93 exhaust emissions could be used to identify vehicles with liquid fuel leaks.

The presence of substantial non-exhaust gasoline vapor coming from vehicles was previously confirmed by IM240 tests. The Colorado Department of Health and Public Environment OBD study, which recruited vehicles from I/M lanes based on high IM240 emissions in test lanes, found five out of 109 vehicles studied had high evaporative rather than high exhaust emissions. The constant volume IM240 emissions collection system drew in not only all the tailpipe exhaust gases but also extra air from around the tailpipe to make up the constant volume. For some vehicles with high evaporative emissions, the air drawn from around the tailpipe contains sufficient evaporative emissions that the vehicles fail the IM240 exhaust emissions test.

The vehicles that failed emissions and associated repairs are listed in Table II-1. All five were successfully repaired. Although Table II-1 shows the measured IM240 grams per mile of HC emissions, it is probable the CVS system only collected a portion of the evaporative emissions and that total evaporative emissions were considerably greater. The majority of these vehicles had sufficient evaporative running losses to be classified as GLLs.

Table II-1: Colorado GLL Vehicles with Evaporative Emissions Results

Vehicle	Year	Make	Model	Max IM240 HC g/mi	Problem / Repair
10	1996	Chev	Camaro	18.4	Disconnected vent line at tank
15	1996	Chev	Camaro	11.6	Disconnected vent line at tank
50	1996	Chev	Camaro	16.6	Disconnected vent line at tank
68	1996	GMC	Sonoma	7.3	Repaired gas cap and evaporative vent solenoid
80	1997	Mazda	MX5 Miata	4.6	New charcoal canister

The IM240 second-by-second results for vehicles with evaporative emissions show an unusual pattern. Figure II-2 shows the second-by-second results for vehicle 50 and the HC to CO and HC to CO2 correlations. Three features are of special interest:

1) HC grams per second remain high during the last few seconds of the test when the vehicle is decelerating and idling

2) HC grams per second are lower from seconds 179 through 200 which is the portion of the test with the highest exhaust volume of exhaust gases and the lowest volume of gasoline vapor laden make-up air

3) The slope of the HC / CO linear regression is negative

By contrast, Figure II-3 shows the same charts for a vehicle with high exhaust HC:

1) HC is low during the last few seconds of the test

2) HC grams per second are higher than average during seconds 170 to 200.

3) HC and CO are correlated with a positive slope.

Figure II-2: IM240 Results for Vehicle Failing for High HC due to Leakage (GLL vehicle)

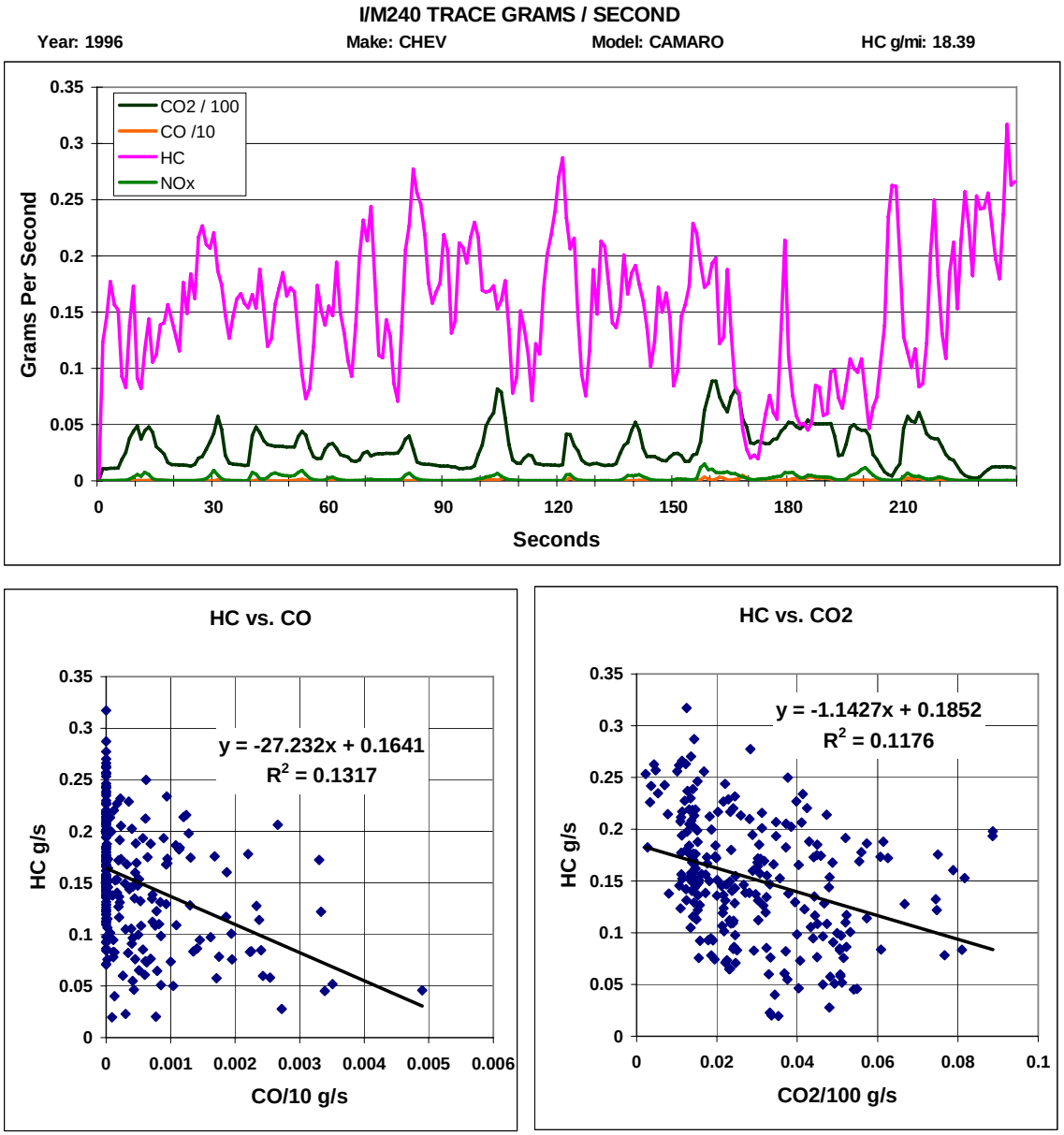
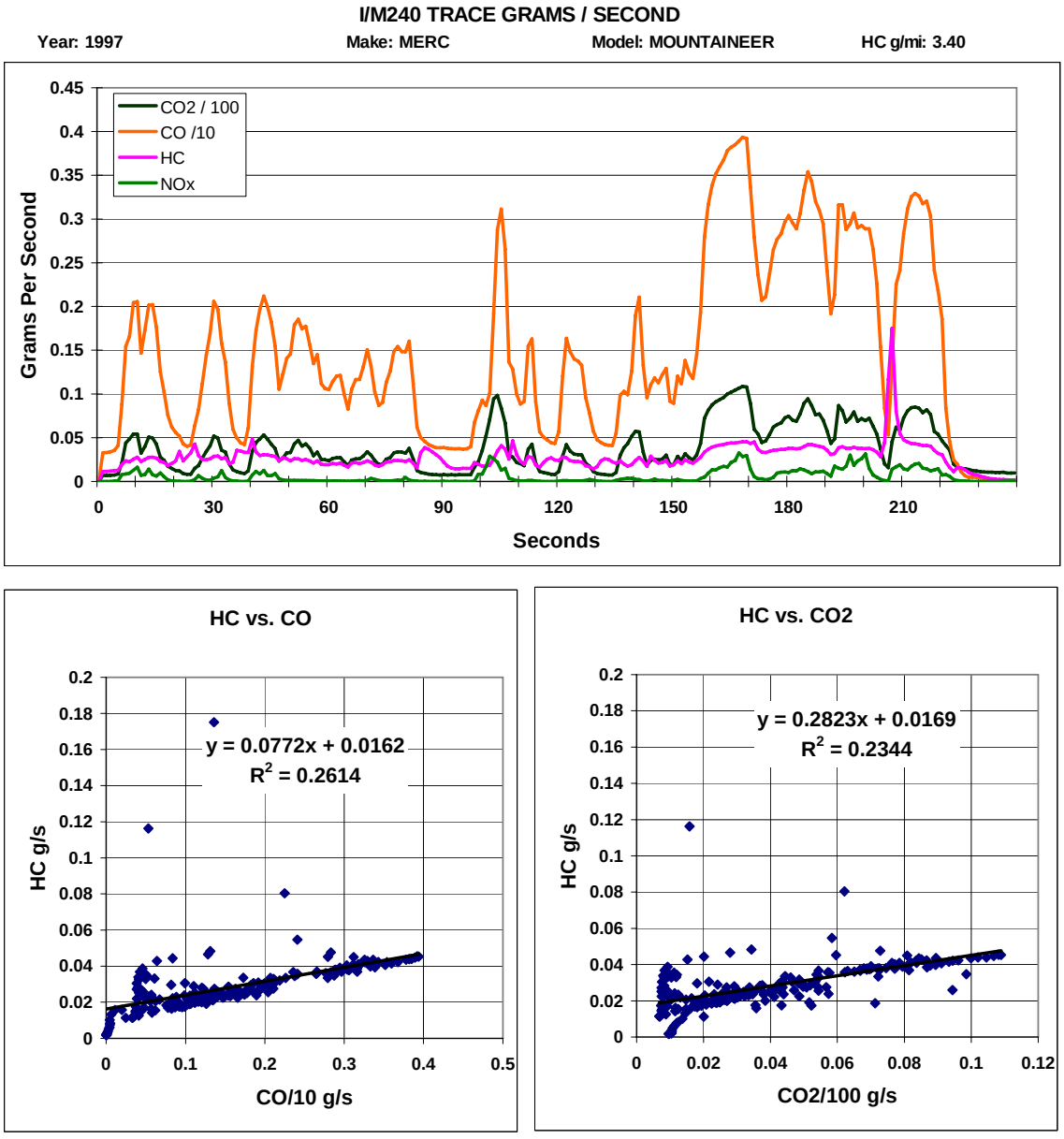


Figure II-3: IM240 Results for Vehicle Failing for High Exhaust Gas HC



For the Indiana Leak Inspection study, ESC analyzed second-by-second IM93 data to characterize, HC, CO and CO2 relationships that indicate the presence of a leak. ESP also examined the analyzer HC emissions for a few seconds after transient tests. These results are discussed in section III.

D. Special Equipment and Visual Inspection

Recruited study vehicles were inspected for leaks in the waiver bay or adjacent test lanes. Vehicles were visually inspected for signs of fuel leaks and the vehicles were wanded with VOC sniffers to look for evaporative emissions. The HC sniffing device is used to check for leaks or vapors around the gas tank, fuel lines and engine compartment. At the same time inspectors looked carefully for any visual signs of leaks, e.g. signs of drips, damp spots or disconnected hoses.

ESC researched and evaluated several alternate handheld HC detectors. The results of the evaluation are summarized in Table II-2.

The Bacharach Leakator 10 is a handheld, battery operated detector with the sensor in the tip of the flexible probe. It indicates HC presence by means of an audible sound and a 10 light LED light bar. The unit was easy to use and had a good response time. It was determined during evaluation that the performance of the detector could be further enhanced if the sample could be drawn over the sensor and to this end a Parker T3CP 1HE 04 1SNB sample pump was installed. The pump pulled a sample over the sensor, down the flexible probe and discharged it outside the unit. It was wired into the battery pack with a switch that allowed the unit to be used with or without the pump.

The MiniRAE 2000 VOC monitor is a handheld, battery operated detector with the sensor inside the unit. It indicates HC presence by means of an audible sound and a digital part-per-million display. The unit was easy to use, had a good response time and included a sample pump because of the sensor location.

The Infrared Industries HM 5000 hand held 4-gas analyzer is a battery operated detector with the sensor inside the unit. It indicates HC, CO, CO2 and O2 presence by means of digital part-per-million/percent display. The unit was easy to use, but had a comparatively slow response time. The unit moved the sample to the analyzer by means of a sample pump.

During the study, the MiniRAE 2000 was selected as the preferred device because of the faster response time and the ability to quantify the detected gas in parts-per-million.

Table II-2: Handheld Equipment Evaluation Summary

Hardware	Cost	Pros	Cons
Bacharach	$275	comparatively inexpensive	needed pump modificiation
Bacharach w Parker pump, alarm & probe	$498	fast response time audible alarm long sample probe	uses alkaline batteries 10 light scale element exposed to contamination element change requires plug-in resistor replacement ($55 kit)
II HM5000	~ $2500	quantifies in PPM can record and upload does CO CO2 O2 also - other uses	no audible alarm slow response time expensive
Mini-RAE 2000	$2,978	quantifies in PPM fast response time programmable audible alarm auto backlight display rechargeable self calibrating/diagnostics	expensive short sample probe length

Figure II-4: MiniRAE 2000

MiniRAE 2000

Portable Handheld VOC Monitor

The rugged MiniRAE 2000 is the smallest pumped handheld volatile organic compound (VOC) monitor on the market. Its Photoionization Detector's (PID) extended range of 0 to 10,000 ppm makes it an ideal instrument for applications from environmental site surveying to HazMat/ Homeland Security.

AutoRAE Compatible

Wireless

Key Features

- **Proven PID technology** The patented sensor provides a 3-second response up to 10,000 ppm and sets a new standard for resistance to moisture and dirt.
- **Wireless communication enabled and certified**
- **Self-cleaning lamp and sensor** The patented self-cleaning lamp and sensor minimize the need for maintenance and calibration.
- **The MiniRAE 2000 lamp and sensor can be taken apart in seconds for easy maintenance without tools!**
- **Measure more chemicals than with any other PID.** With over 100 Correction Factors built into the MiniRAE 2000 memory and the largest printed list of Correction Factors in the world (300+), RAE Systems offers the ability to accurately measure more ionizable chemicals than any other PID. When a gas is selected from the MiniRAE 2000's library, the alarm points are automatically loaded into the meter.
- **User friendly** screens make it easy to use for simple applications and flexible enough for sophisticated operations.
- **Drop-in battery** When work schedules require putting in more than the 10 hours supplied by the standard NiMH battery, the drop-in alkaline pack supplied with every MiniRAE 2000 lets you finish the job.
- **Rugged Rubber Boot** The standard rubber boot helps assure that the MiniRAE 2000 survives the bumps and knocks of tough field use.
- **Strong, built-in sample pump** draws up to 100 feet (30 m) horizontally or vertically.
- **Tough, flexible inlet probe**
- **Large keys** operable with 3 layers of gloves.
- **Easy-to-read display** with backlight.
- **Stores up to 267 hours of data** at one-minute intervals for downloading to PC.
- **3-year 10.6 eV lamp warranty**

Applications

HazMat/Homeland Security

- Initial PPE (personal protective equipment) assessment
- Leak detection
- Safety perimeter establishment and maintenance
- Spill delineation
- Decontamination
- Remediation

Industrial Hygiene/Safety

- Confined Space Entry (CSE)
- Indoor Air Quality (IAQ)
- Worker exposure studies

Environmental

- Soil and water headspace analysis
- Leaking underground storage tanks
- Perimeter fenceline monitoring
- Fugitive emissions (EPA Method 21)
- Vapor recovery breakthrough
- Landfill monitoring

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E. HCLP Inspection Procedure

During the HCLP procedure study period, vehicles failing HC were recruited from two sources for the leak inspection:

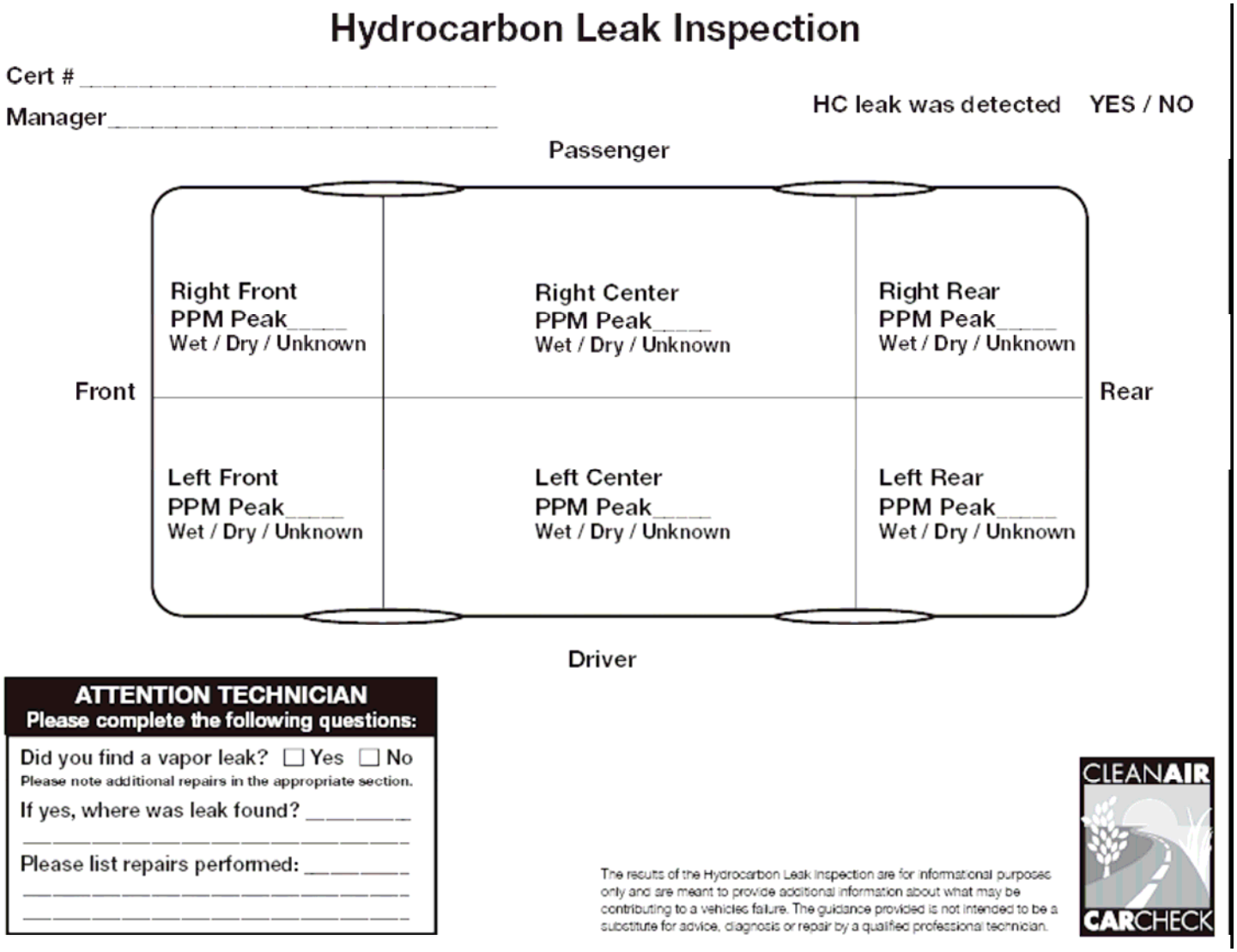
- 1995 & older model vehicles failing HC in the IM93 test lanes;
- vehicles Repair Advisor appointments that had previously failed the IM93 for HC.

Vehicles that failed HC in the lanes were identified by the position two inspector and this information was relayed to the HCLP inspector. At the end of the normal I/M test, the HCLP inspector provided the vehicle owner information about the pilot study with the offer of a brief, free, non-mandatory inspection that could aid in the diagnosis of the HC source. This offer was met with almost unanimous acceptance.

Vehicles were directed into either the waiver bay or an adjacent idle test lane. If the test lane was used, the overhead door was lowered. The motorist was invited to remain in the vehicle and release the hood and fuel door. Attention was paid to the natural air movement in the area. The inspections began at the fuel fill area at the rear or one side of the vehicle. That area was scanned moving up the underside of the vehicle, through the wheel wells to the front paying equal attention to the instrument feedback and the inspector's sense of smell. The other side of the vehicle was then inspected similarly. The hood was raised and engine compartment was scanned paying particular attention to fuel system parts. When an HC response was detected, the detector was used to close in as near as possible to the source, preferably visually identifying the leak.

Results of the inspection were recorded for the study. Owners of vehicles that had HC leaks detected during the study received a notation on the back of the fail report with information about the leak for repair personnel. During the course of the study a standard diagram entry form was developed (see next page).

Figure II-5: Leak Inspection Result Form



Hydrocarbon Leak Inspection

Cert # _____

Manager_____

HC leak was detected YES / NO

Passenger

Right Front PPM Peak_____ Wet / Dry / Unknown	Right Center PPM Peak_____ Wet / Dry / Unknown	Right Rear PPM Peak_____ Wet / Dry / Unknown
Left Front PPM Peak_____ Wet / Dry / Unknown	Left Center PPM Peak_____ Wet / Dry / Unknown	Left Rear PPM Peak_____ Wet / Dry / Unknown

Front

Rear

Driver

ATTENTION TECHNICIAN
Please complete the following questions:

Did you find a vapor leak? ☐ Yes ☐ No

Please note additional repairs in the appropriate section.

If yes, where was leak found? _____

_____

Please list repairs performed: _____

_____

_____

The results of the Hydrocarbon Leak Inspection are for informational purposes only and are meant to provide additional information about what may be contributing to a vehicles failure. The guidance provided is not intended to be a substitute for advice, diagnosis or repair by a qualified professional technician.

CLEANAIR CARCHECK

F. Sources of Data and Description of Elements

At the conclusion of the IM93 emission inspection, the results are calculated and the complete set of inspection results including the second by second sample result of HC, CO, NOX and CO2 are transmitted to the central depository on the Host machine. Currently, if the vehicle fails because of excess emission of Hydro Carbon (HC), the inspector is alerted that the vehicle requires further inspection to check for HC leaks.

After the inspector completes the HC Leak Inspection, he/she enters the details and result of the inspection at the manager PC. In the study, the leak inspection and IM93 results have been compiled using Excel.

As part of the program deployment, the system will be modified to attach leak inspection results to the vehicle test results at the Host computer. The results and details of all the HC Leak Inspections along with their corresponding emission test results and second by second gas reading will then be able to be retrieved from the Host for further analysis.

III. Summary of Data Collection

A. Simulated leaks using propane

ESC performed some preliminary work to test effectiveness of the IM93 lane equipment at detecting evaporative emissions by flowing propane under a test vehicle. During these trials, ESC experimented with using one or both of the two available CVS hoses that are used to collect vehicle exhaust.

A 1998 Chevrolet Malibu was run on 7/24/07 to investigate how an HC leak might be simulated and how an HC leak on an otherwise properly running vehicle would appear on a fail report trace. In all the simulated HC leak tests, the 2nd CVS hose was placed on the floor at the rear of the vehicle. The Malibu has an effective evaporative emission system, good fuel control and functional catalytic converter. To simulate an HC leak, a propane enrichment tool was used to discharge a small flow of propane at different points around the vehicle. Five SCFH was flowed first under the center of the vehicle to get a baseline point. The flow was reduced to 2 SCFH on subsequent runs. Placements included the right front under hood, under the center of the vehicle, and the left rear wheel well.

The Malibu was run again on 7/26/07 to get a baseline on the vehicle without the simulated HC leak. The vehicle was false failed by directly flowing diluted NOx span gas to the analyzer while the test was run so a fail report would be generated. The first run was in the normal configuration for a single exhaust vehicle. The 2nd CVS hose was laid on the floor at the rear of the vehicle during the second run.

The results of these runs are shown in Table III-1 and the charts following. The IM93 second-by-second emission trace clearly shows when propane was flowed under the vehicle.

Table III-1 Simulated Leak Tests Using Propane Gas

7/24/2007	1298	1998	Chevy	Malibu	3026428	simulated	Center flowing 5 SCFH 2 Hose Sample
7/24/2007	1298	1998	Chevy	Malibu	3026429	simulated	Center flowing 2 SCFH 2 Hose Sample
7/24/2007	1298	1998	Chevy	Malibu	3026431	simulated	R/F Underhood 2 SCFH Into Fender 2 Hose Sample
7/24/2007	1298	1998	Chevy	Malibu	3026432	simulated	L/R Wheel 2 SCFH 2 Hose Sample
7/26/2007	1298	1998	Chevy	Malibu	3007149	simulated	no propane - 1 hose sample
7/26/2007	1298	1998	Chevy	Malibu	3007150	simulated	no propane - 2 hose sample

FAILURE AND REPAIR REPORT

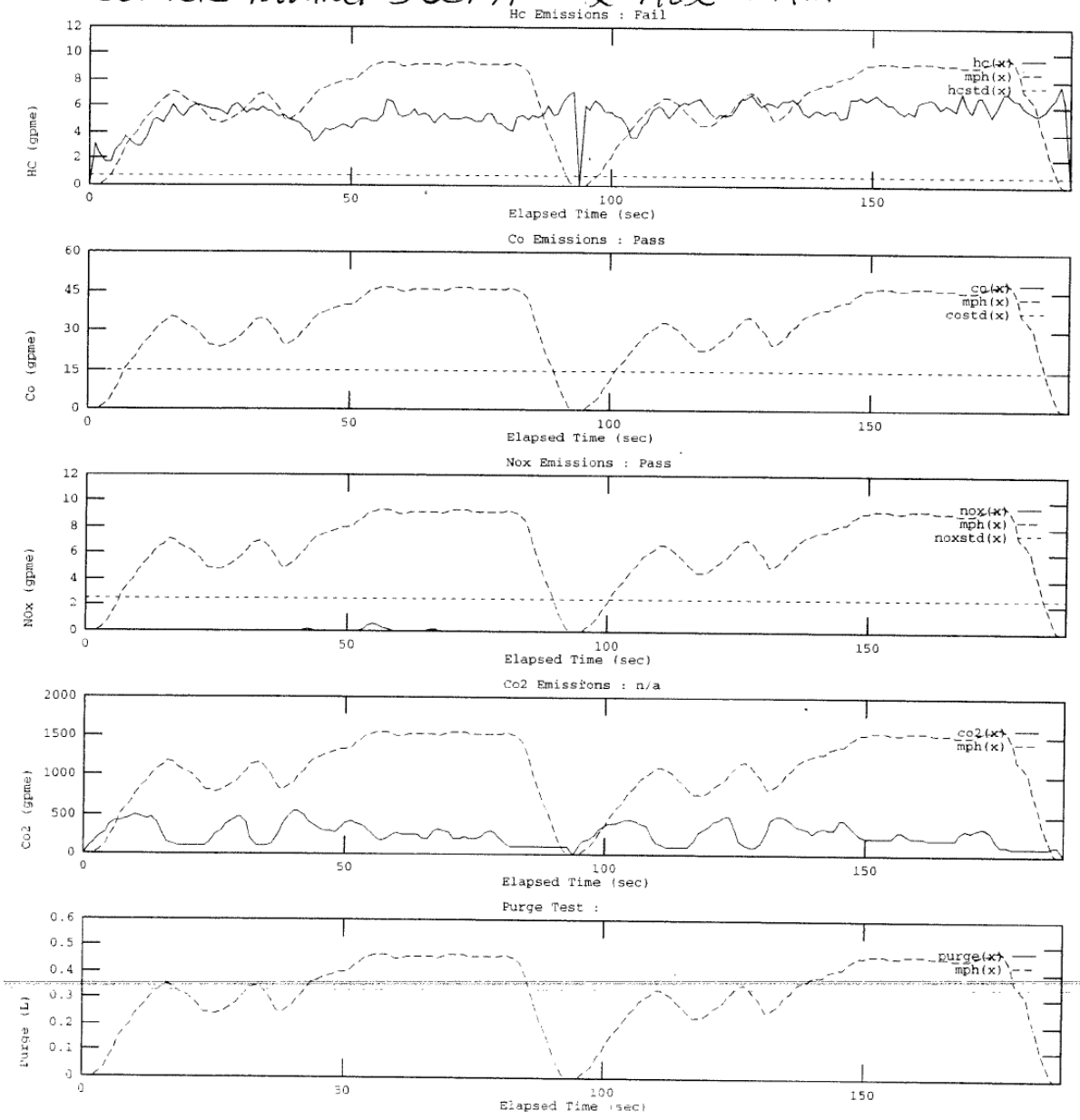
03026428

Your vehicle has failed the inspection for the reasons given below. This Report contains information that will help a repair technician diagnose and repair your vehicle. **WARNING: NO VEHICLE REGISTRATION WILL BE ISSUED UNTIL THE VEHICLE HAS PASSED AN INSPECTION OR IS GRANTED A WAIVER**

Emissions Failure Type: HC		**Tampering Failure Type:**	
Plate:		**Test Time:**	07/24/07 13:55
Vin:	1G1ND52M2W6181298	**Test No:**	1
Make:	CHEV	**GVWR:**	0
Model:	MALIBU	**FUEL:**	Gasoline
Model Year:	1995		

Emission	Reading	Standard	Result
HC (gpm)	8.11	0.80	Fail
CO (gpm)	0.00	15.00	Pass
NOx (gpm)	0.00	2.50	Pass
CO2 (gpm)	354.60	n/a	n/a
Purge (L)	n/a	n/a	n/a

CENTER FLOWING 5 SCFH 2 HOSE SAMPLE



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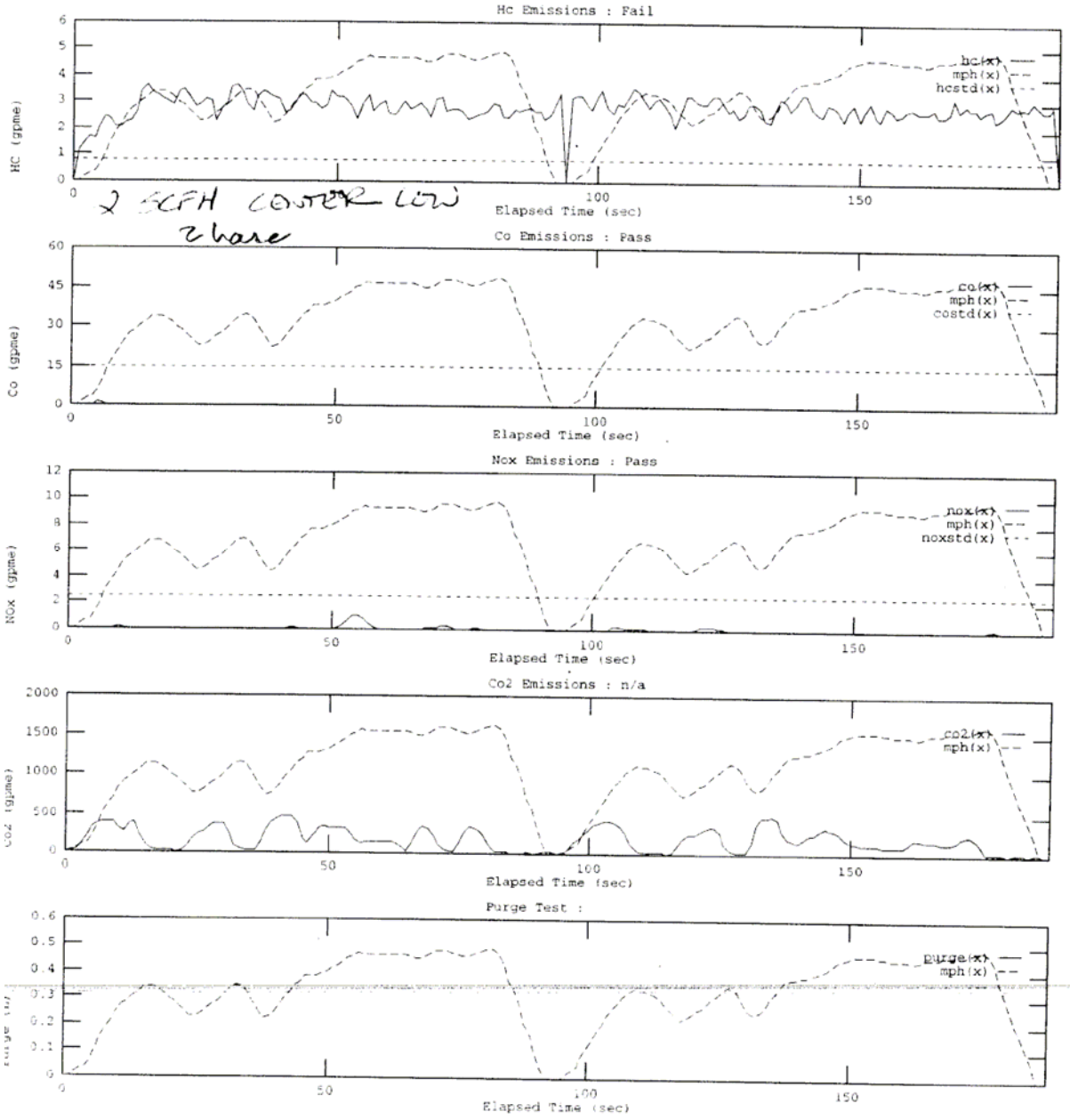
Emissions Failure Type: HC		**Tampering Failure Type:**				
Plate:		**Test Time:**	07/24/07 14:11	**Emission**	**Reading**	**Standard**	**Result**
Vin:	1G1ND52M2W6181298	**Test No:**	2	HC (gpm)	3.84	0.80	Fail
Make:	CHEV	**GVWR:**	0	CO (gpm)	0.00	15.00	Pass
Model:	MALIBU	**FUEL:**	Gasoline	NOx (gpm)	0.04	2.50	Pass
Model Year:	1995			CO2 (gpm)	236.40	n/a	n/a
				Purge (L)	n/a	n/a	n/a



03026429

FAILURE AND REPAIR REPORT

03026431

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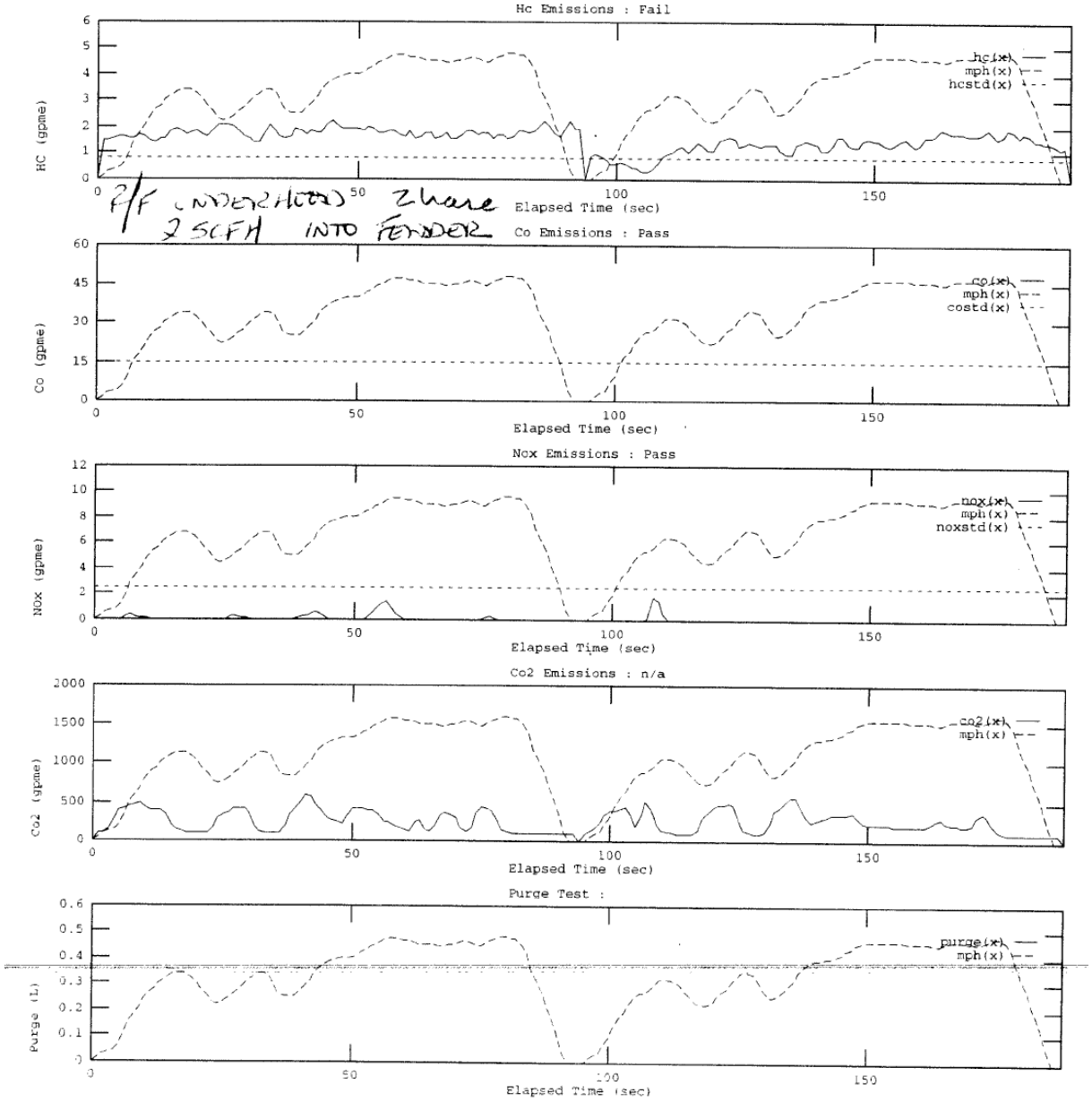
Emissions Failure Type: HC		**Tampering Failure Type:**				
Plate:		**Test Time:**	07/24/07 14:27	**Emission**	**Reading**	**Standard**	**Result**
Vin:	1G1ND52M2W6181298	**Test No:**	1	HC (gpm)	1.77	0.80	Fail
Make:	CHEV	**GVWR:**	0	CO (gpm)	0.00	15.00	Pass
Model:	MALIBU	**FUEL:**	Gasoline	NOx (gpm)	0.05	2.50	Pass
Model Year:	1995			CO2 (gpm)	348.50	n/a	n/a
				Purge (L)	n/a	n/a	n/a



F/F (UNDERHOOD) 2 hose 2 SCFM INTO FENDER

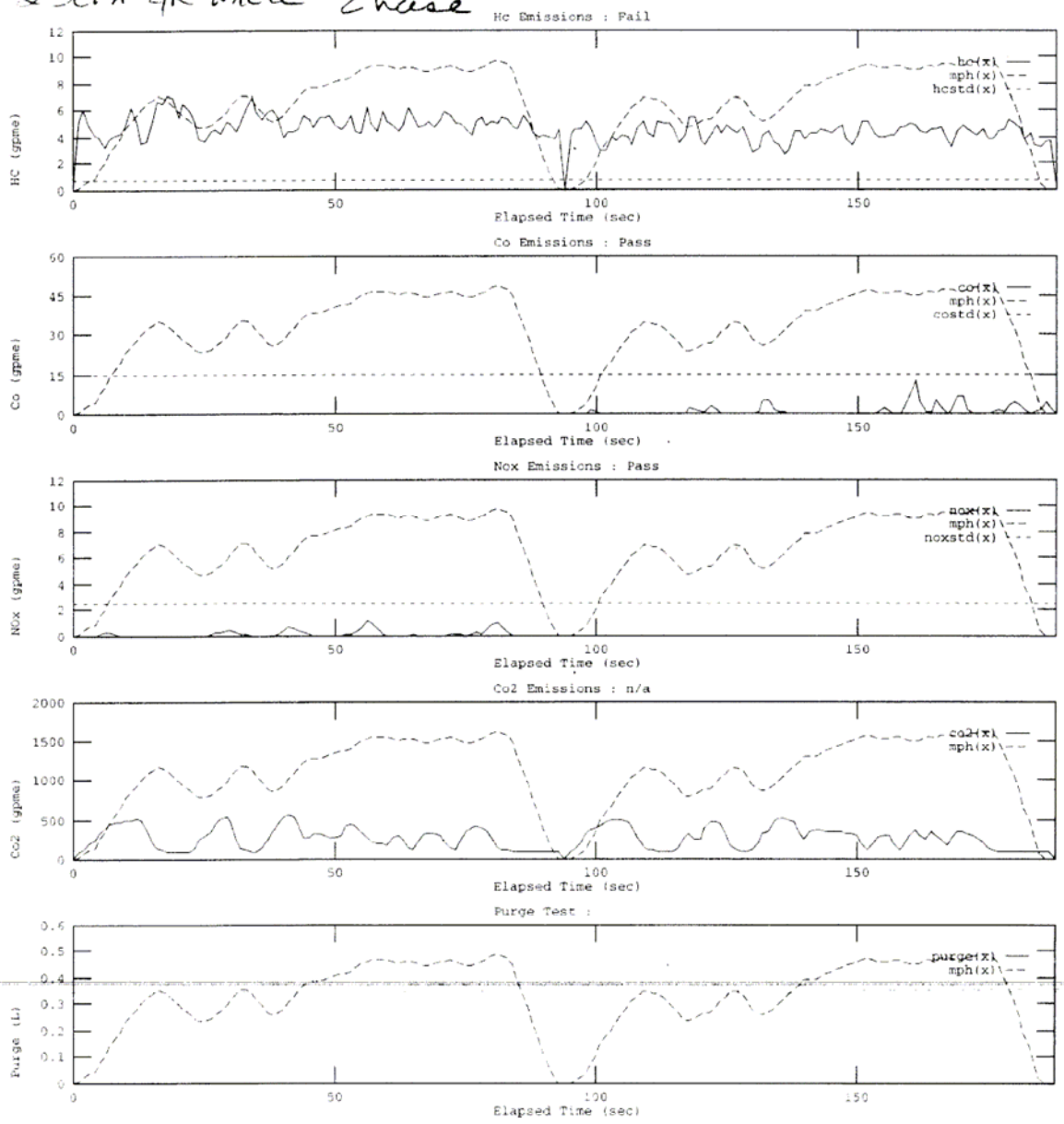
03026431

FAILURE AND REPAIR REPORT 03026432

Your vehicle has failed the inspection for the reasons given below. This Report contains information that will help a repair technician diagnose and repair your vehicle. **WARNING: NO VEHICLE REGISTRATION WILL BE ISSUED UNTIL THE VEHICLE HAS PASSED AN INSPECTION OR IS GRANTED A WAIVER**

Emissions Failure Type: HC		**Tampering Failure Type:**			
Plate:		**Test Time:** 07/24/07 15:22	**Emission**	**Reading**	**Standard**	**Result**
Vin:	1G1ND52M2W6181298	**Test No:** 1	HC (gpm)	5.72	0.80	Fail
Make:	CHEV	**GVWR:** 0	CO (gpm)	1.60	15.00	Pass
Model:	MALIBU	**FUEL:** Gasoline	NOx (gpm)	0.00	2.50	Pass
Model Year:	1995		CO2 (gpm)	356.20	n/a	n/a
			Purge (L)	n/a	n/a	n/a

2 SCFM 4/K WATER 2 hose

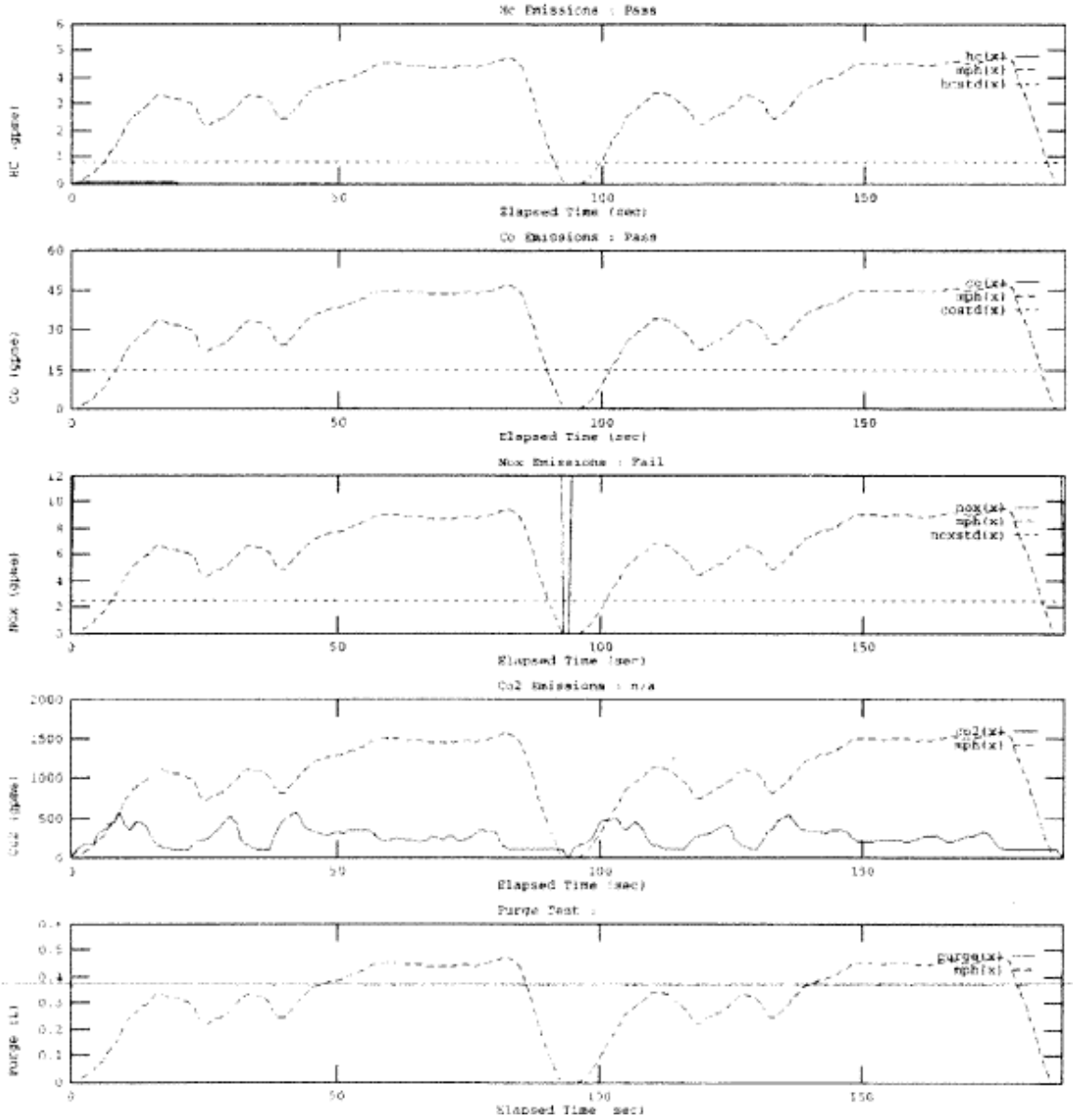


03026432

FAILURE AND REPAIR REPORT 03007149

Your vehicle has failed the inspection for the reasons given below. This Report contains information that will help a repair technician diagnose and repair your vehicle. **WARNING: NO VEHICLE REGISTRATION WILL BE ISSUED UNTIL THE VEHICLE HAS PASSED AN INSPECTION OR IS GRANTED A WAIVER**

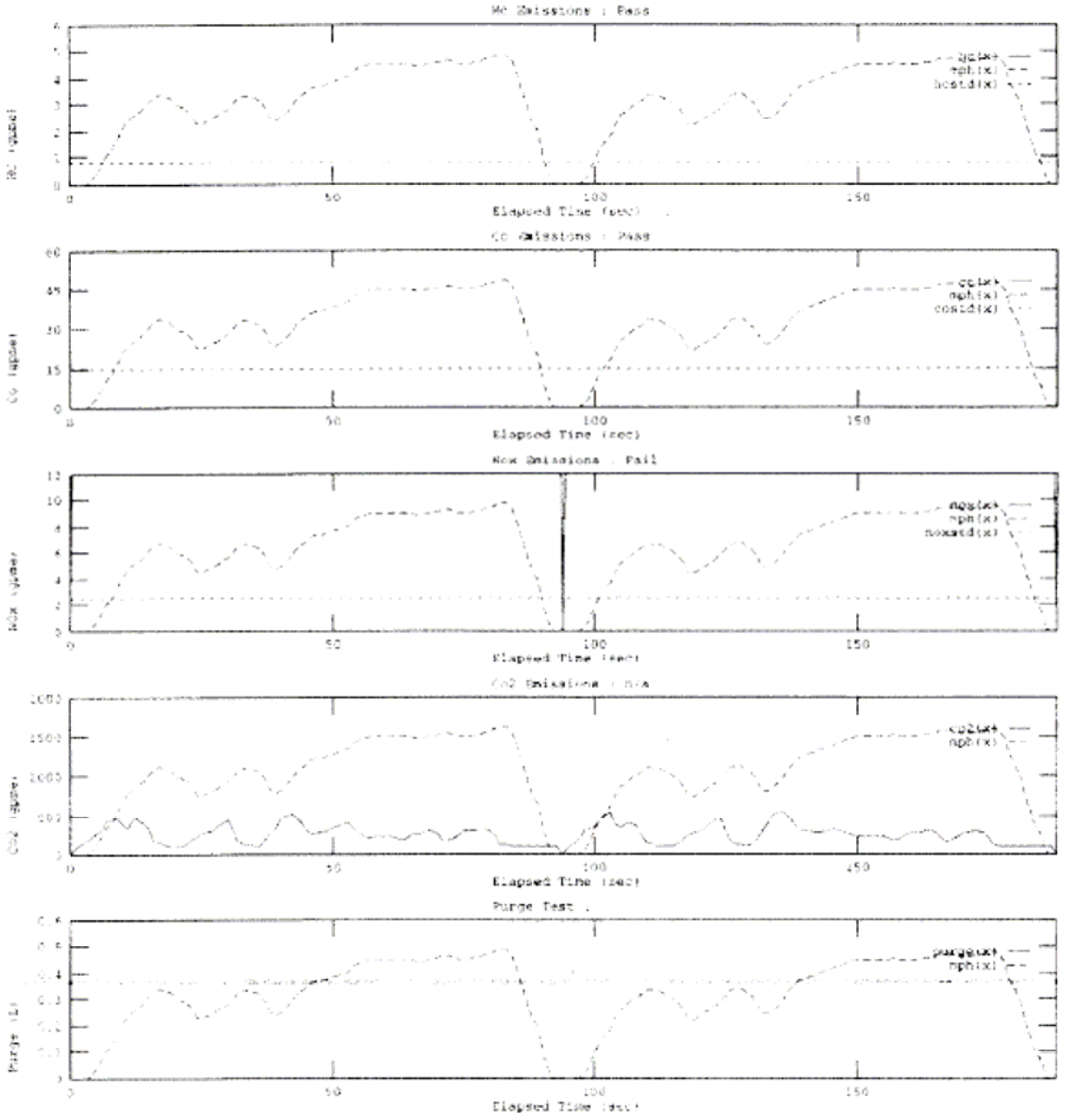
Emissions Failure Type: NOX		**Tampering Failure Type:**			
Plate:	**Test Time:** 07/26/07 12:16	**Emission**	**Reading**	**Standard**	**Result**
Vin: 1G1ND52M2W6181298	**Test No:** 1	HC (gpm)	0.00	0.80	Pass
Make: CHEV	**GVWR:** 0	CO (gpm)	0.00	15.00	Pass
Model:	**FUEL:** Gasoline	NOx (gpm)	51.31	2.50	Fail
Model Year: 1995		CO2 (gpm)	344.70	n/a	n/a
		Purge (L)	n/a	n/a	n/a



FAILURE AND REPAIR REPORT 03007150

Your vehicle has failed the inspection for the reasons given below. This Report contains information that will help a repair technician diagnose and repair your vehicle. **WARNING: NO VEHICLE REGISTRATION WILL BE ISSUED UNTIL THE VEHICLE HAS PASSED AN INSPECTION OR IS GRANTED A WAIVER**

Emissions Failure Type: NOX		**Tampering Failure Type:**				
Plate:		**Test Time:** 07/26/07 12:31	**Emission**	**Reading**	**Standard**	**Result**
Vin:	1G1ND52M2W6181298	**Test No:** 1	HC (gpm)	0.01	0.80	Pass
Make:	CHEV	**GVWR:** 0	CO (gprn)	0.00	15.00	Pass
Model:		**FUEL:** Gasoline	NOx (gpm)	51.00	2.50	Fail
Model Year:	1998		CO2 (gpm)	343.00	n/a	n/a
			Purge (L)	n/a	n/a	n/a



B. Plan B – Alternative Leak Detection

ESC performed a second series of simulated HC leak runs to evaluate the potential of an alternative method of identifying leaking vehicles. This method gathered emission data at the end of the first trace. During the idle period between traces, HC emission data was gathered with the simulated 2 standard cubic feet per hour propane flow at the front of the vehicle, engine idling or off, and with one or both CVS hoses employed. See Table III.2 below. This method may have future potential for identifying leaks in non-failing IM93 vehicles or, with modification, BAR 90 and OBD2 vehicles

Modifications were required to the lane to gather this data. HC analyzer millivolt output was wired in a parallel circuit to a volt meter with data storage capability. The CVS sample train, which is normally idle between and at the end of traces, was activated from a laptop. A diluted NOx source was introduced to the NOx analyzer to force fails and therefore double IM93 traces during the baseline run.

At the end of the first trace, the CVS sample train and analyzers were reactivated and the millivolt data was recorded. The millivolt data was transferred to an Excel sheet along with the analyzer curve information to allow for the conversion to HC ppm values.

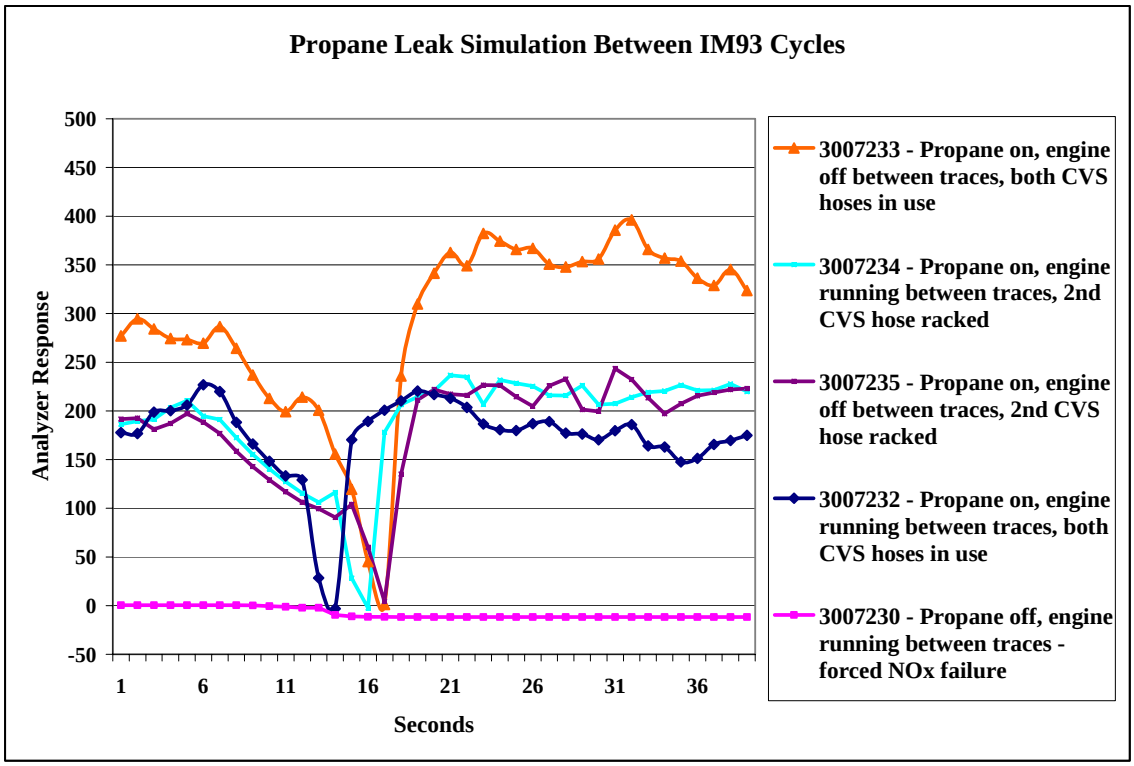
The analyzer responses to various scenarios tested are shown in Figure 3-1. The trace starts at the end of the IM93 trace. During the next 15-20 seconds, the analyzer CVS collection system shuts down and the gas values fall to zero. The analyzer CVS is then restarted and the propane flow is clearly visible except in the case 3007230 where no propane was flowing. This demonstrates the ability of the analyzer system to detect HC independently of the IM93 test.

Charts showing the IM93 second-by-second results for these tests are provided in Appendix B and can be associated by the VIR number. Note that in Appendices B and C the gram per mile values reported are the average over both IM93 cycles. In contrast, VIR reports show the results for the specific IM93 cycle in which the vehicle passed or failed.

Table III-2 Plan B- Alternative Leak Identification

test date	VIN 4	Year	Make	Model	VIR	HCLP result	comment
8/31/2007	1298	"1995"	Chevy	Malibu	3007230	Plan B	baseline - no propane - data between traces - forced NOx failure
8/31/2007	1298	"1995"	Chevy	Malibu	3007232	Plan B	propane on - engine idling between traces - 2 hoses at rear
8/31/2007	1298	"1995"	Chevy	Malibu	3007233	Plan B	propane on - engine off between traces - 2 hoses at rear
8/31/2007	1298	"1995"	Chevy	Malibu	3007234	Plan B	propane on - engine idling between traces - 2nd hose racked
8/31/2007	1298	"1995"	Chevy	Malibu	3007235	Plan B	propane on - engine off between traces - 2nd hose racked

Figure III-1 Analyzer Response Between IM93 Cycles to Simulated Leak



C. Repair Advisor Recruits

During the study period, several vehicles were referred by the Repair Advisor.

A 1991 Ford Probe (#1, VIR 3025912) was presented to the Repair Advisor on 7/24/07 having failed 4 consecutive tests for HC. The Repair Advisor suspected an HC leak based on the smell of gasoline around the vehicle and a check of the exhaust with a 5-gas analyzer. The vehicle was in the waiver bay, engine off, with a fan blowing on it from the front.

The Bacharach Leakator 10 was used to try to locate a leak. Starting at the rear left and working forward, a small response was observed under the drivers door area. The fan in front of the vehicle was turned off and this response was lost. The inspection continued forward and then under the hood. While checking around the injectors and intake manifold, a strong response was noted by the fuel dampener[1]. The dampener was wet with fuel. The response was confirmed with the 5-gas analyzer.

[1] A fuel dampener is an air reservoir directly connected to the fuel line that helps smooth sudden changes in fuel pressure.

The Probe was moved to the dyno and two runs were made. The first was a standard run with the exception of the 2nd CVS hose being placed at the rear of the vehicle. The second was the same with the hood up to see how changing airflow around the vehicle would compare. HC emissions were greater with the hood down, which might be expected as more evaporative emissions would then be blown under the vehicle to the CVS collectors at the rear.

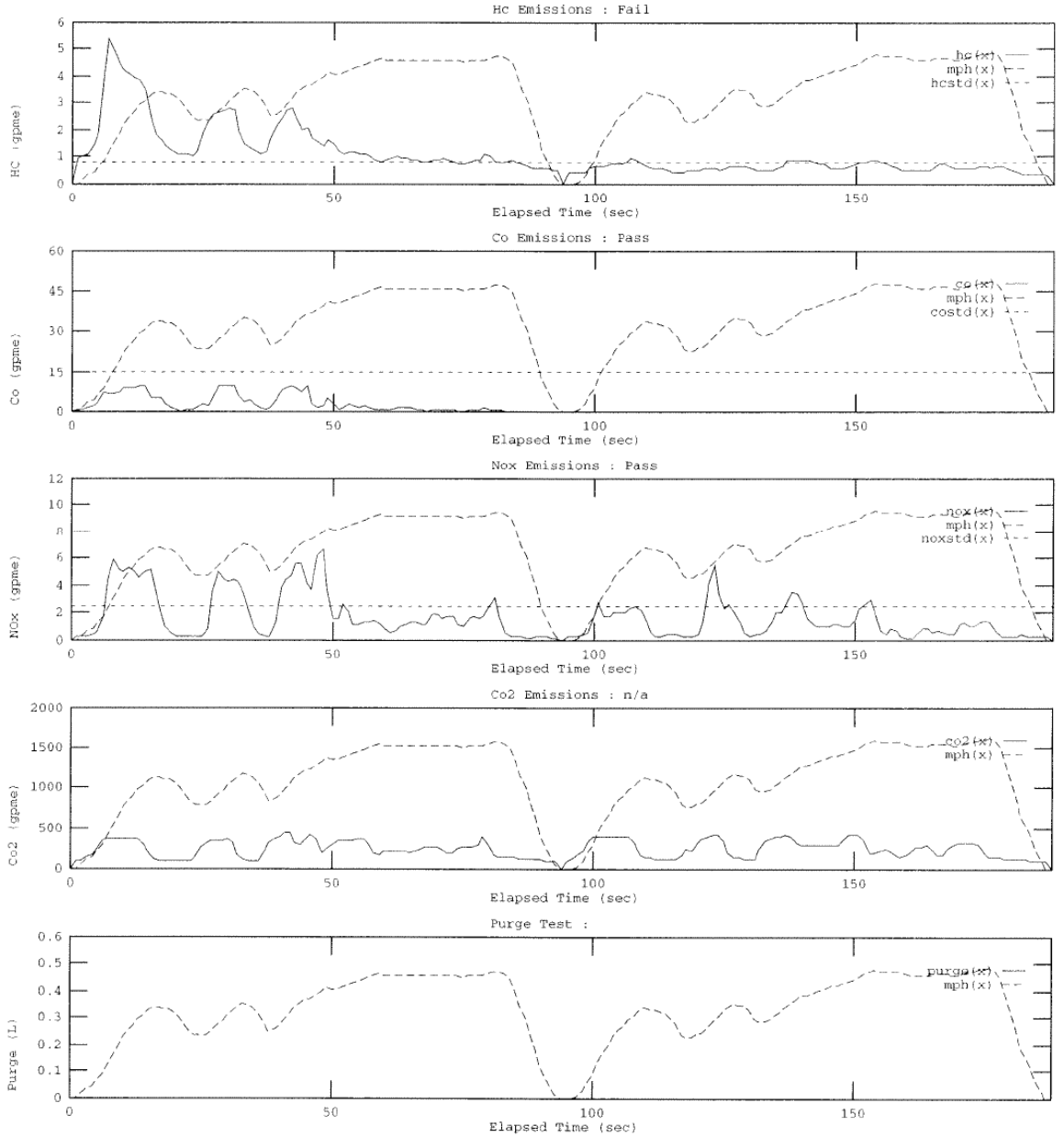
On 7/27/07 the vehicle returned with the fuel dampener replaced. The vehicle fast-passed the IM93 test.

The 'Failure and Repair' reports shown on the following pages show the test results before (VIR 302591) and after repair (VIR 3026964). On the test before repair, HC diminishes over the first minute of the first IM93 cycle but it then remains at a roughly constant value for the remainder of the first cycle and throughout the second cycle. In the report after repair, HC again starts slightly high at the start of the first cycle but then diminishes within 30 seconds to close to zero and the vehicle fast-passes.

FAILURE AND REPAIR REPORT 03025912

Your vehicle has failed the inspection for the reasons given below. This Report contains information that will help a repair technician diagnose and repair your vehicle. **WARNING: NO VEHICLE REGISTRATION WILL BE ISSUED UNTIL THE VEHICLE HAS PASSED AN INSPECTION OR IS GRANTED A WAIVER**

Emissions Failure Type: HC		**Tampering Failure Type:**				
Plate: 45C8533	**Test Time:** 07/16/07 14:58	**Emission**	**Reading**	**Standard**	**Result**
Vin: 1ZVPT20C2M5105835	**Test No:** 4	HC (gpm)	0.83	0.80	Fail
Make: FORD	**GVWR:** 0	CO (gpm)	0.00	15.00	Pass
Model: PROBE	**FUEL:** Gasoline	NOx (gpm)	1.65	2.50	Pass
Model Year: 1991		CO2 (gpm)	335.90	n/a	n/a
		Purge (L)	n/a	n/a	n/a



03025912

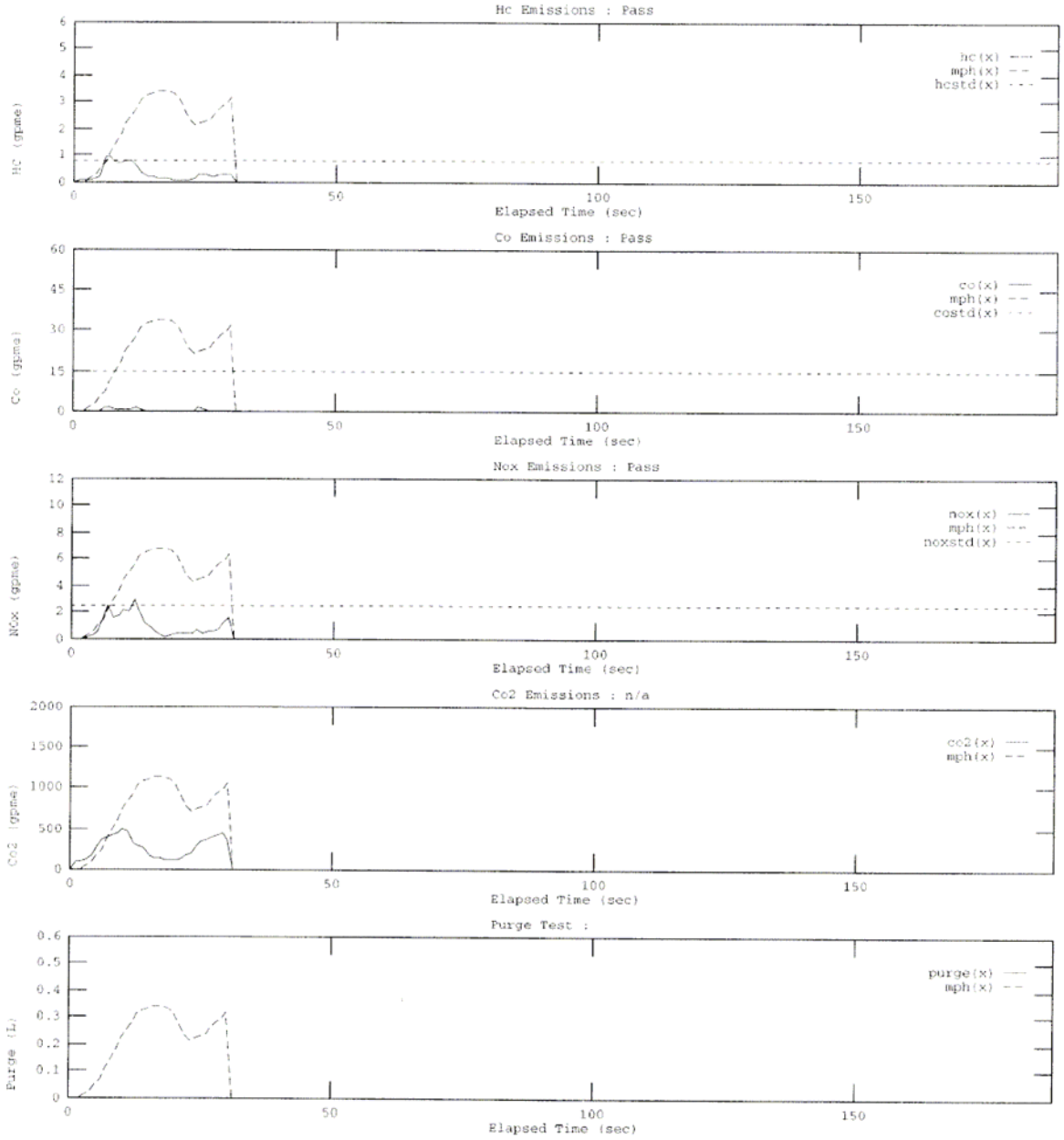
FAILURE AND REPAIR REPORT

03026964

Your vehicle has failed the inspection for the reasons given below. This Report contains information that will help a repair technician diagnose and repair your vehicle. **WARNING: NO VEHICLE REGISTRATION WILL BE ISSUED UNTIL THE VEHICLE HAS PASSED AN INSPECTION OR IS GRANTED A WAIVER**

Emissions Failure Type:		**Tampering Failure Type:**	

Plate:	45C8533	**Test Time:**	07/27/07 16:45	**Emission**	**Reading**	**Standard**	**Result**
Vin:	1ZVPT20C2M5105835	**Test No:**	5	HC (gpm)	0.15	0.80	Pass
Make:	FORD	**GVWR:**	0	CO (gpm)	0.10	15.00	Pass
Model:	PROBE	**FUEL:**	Gasoline	NOx (gpm)	0.43	2.50	Pass
Model Year:	1991			CO2 (gpm)	118.80	n/a	n/a
				Purge (L)	n/a	n/a	n/a



03026964

Other vehicles from the Repair Advisor included:

- 1995 Pontiac Firebird (#5,VIR:2911477)

The Repair Advisor inspected the vehicle on 7/12/2007. The customer stated that the repair technician had been inserting a probe into the muffler and not detected high hydrocarbon readings. The Advisor discovered a fuel tank vapor leak. The fuel tank was removed and all vapor leaks were repaired. The vehicle was retested and passed on 9/6/2007.

- 1991 Chevy Corvette (#6, VIR:2938521)

Vehicle had repairs performed by certified emission repair service center. The service center stated that there was excessive tank pressure causing fumes to leak from gas tank. The charcoal canister had come apart and plugged the purge solenoid. The pressure valve and the line from the tank to the engine all needed to be replaced. After replacement and repair of these items the vehicle failed again. The repair center recommended getting the vehicle waived

- 1991 Chevy Camaro (#7, VIR:2991705)

8/9/2007 Plugs, wires, cap, rotor, PCV valve and EGR valce were replaced. Filler neck tube was repaired. New fuel pump and filter installed.

- 1991 Pontiac Firebird (#8,VIR:2975555)

No repair information available.

- 1991 Chevy Camaro (#9, VIR:3025656)

Vehicle was seen by the Repair Advisor on 8/7/07. He identified a non-OEM O2 sensor, stretched sensor wires, EGR fault codes and a fuel tank vapor leak. The repairs recommended were to repair or replace the O2 sensor and spark plug wires. Replace or repair the EGR valve. Remove gas tank and repair all fuel vapor leaks and retest the vehicle. At this time the customer has not performed the repairs nor had the vehicle retested.

All these vehicles were determined to have evaporative emissions leaks using the Repair Advisor's 5-gas analyzer and evaporative emissions were clearly detected in their second-by-second HC emissions. The emissions trace charts are provided in Appendix C.

D. I/M Recruits

From late July through mid-September, 2007, ESC recruited vehicles that failed their exhaust emissions test for hydrocarbons. These vehicles were good candidates for the study because these vehicles all had two complete 93-second emissions traces that could be analyzed for evaporative emissions indicators. Also, as it turned out, about half these vehicles had evaporative emissions.

Further recruitment and inspection of a random sample will need to be performed to determine the frequency of evaporative emitters in the population of vehicles that pass their exhaust HC test.

Vehicle owners were generally cooperative and pleased to have additional diagnosis performed on the failing vehicle. The combination of free assistance and non-mandatory terms was accepted by everyone that understood the offer. Only one motorist who thought the offer was a customer service survey refused to stay citing time constraints.

Following their normal I/M inspection, vehicles were inspected in the waiver bay or idle test lane using either the Bacharach Leakator 10 or the MiniRAE 2000.

Table III-3 summarizes the results of the leak inspections by model year, including the six Repair Advisor referral vehicles.

Table III-3 Leak Inspection Results by Model Year

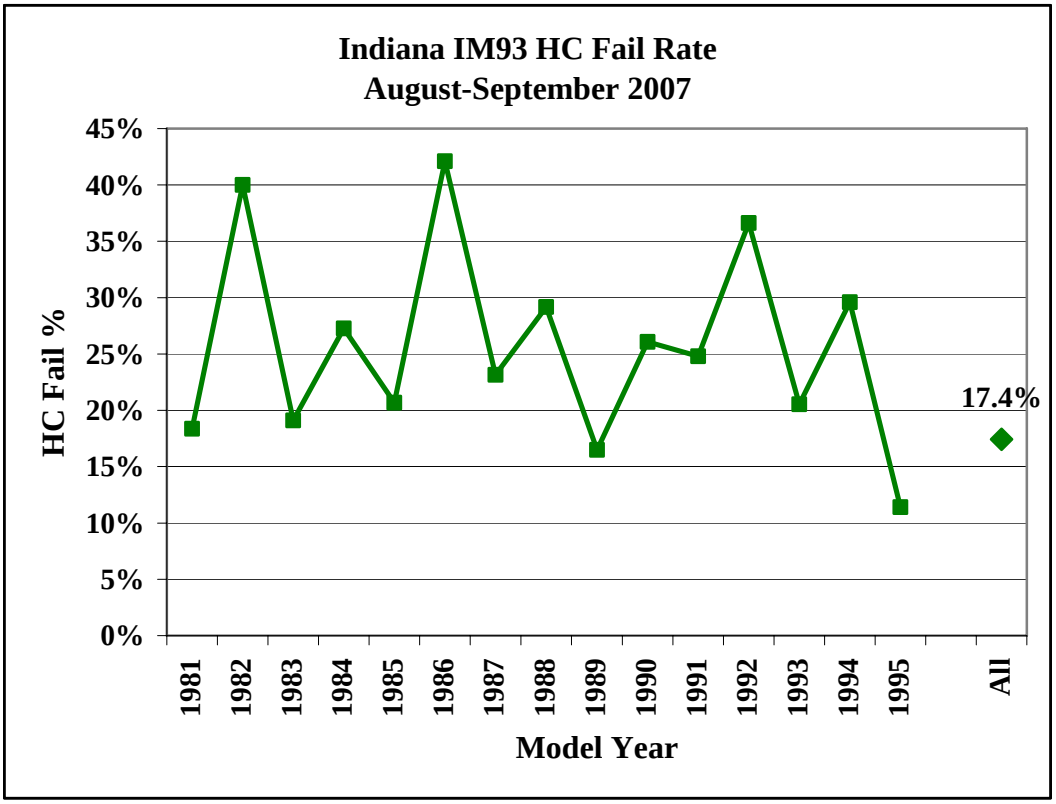
Model Year	Evaporative HC Detected			
	No	Yes	Total	Yes %
1983	1	1	2	50%
1985	1	3	4	75%
1986	1	0	1	0%
1987	3	6	9	67%
1988	0	1	1	100%
1989	1	6	7	86%
1991	11	9	20	45%
1992	3	1	4	25%
1993	16	14	30	47%
1994	1	2	3	67%
1995	9	10	19	53%
Total	**47**	**53**	**100**	**53%**

As expected, a greater number of odd-model years were seen as a result of the biennial nature of the I/M program. Evaporative emissions were detected on 53% of the vehicles. If the six Repair Advisor vehicles are removed, 47 out of 94 vehicles had some evaporative emissions detected – exactly 50%.

Of the 53 vehicles with evaporative emissions, 12 were related solely to the gas cap and filler neck. The other 41 vehicles had HC emissions detected either under the hood or under the body.

During the study period, the IM93 fail rate for HC was 17.4% (Figure III-2). Assuming the half of these had evaporative emissions, the percentage of 1995 and older models with evaporative emissions is projected to be 8.7% plus the percentage that pass IM93 with evaporative emissions.

Figure III-2 IM93 Fail Rates for HC



For some vehicles the leak inspection was very helpful in the diagnosis and repair of vehicles that had repeatedly failed the IM93 test.

For example, on 8/21/07, a 1991 Ford Mustang was inspected for HC leaks with the MiniRAE 2000. A strong response was identified near the evap canister. Further visual inspection revealed the tank vent line disconnected from the canister. The Repair Advisor confirmed the correct route and the line was reconnected. The vehicle was tested and fast passed.

Review of the recent vehicle history with the owner and a check of available documents revealed the following. The owner tuned up the vehicle prior to its first test in the spring. After the first failure, the vehicle had been worked on at a shop where some sensors were changed at a cost of $295.00. Later in the summer, the vehicle was brought back for testing, but the rear brakes were insufficient to complete the test. These were repaired before the next 3 tests were performed. After the fourth test, the HCLP inspection was performed and the vehicle was repaired.

Table III-4 shows results by Make. It will require additional data to determine if there are any models that are more likely to have evaporative leaks.

Table III-4 Leak Inspection Results by Make

Model	Evaporative HC Detected			
Make	No	Yes	Total	Yes %
Ford	1	0	1	0%
Buick	4	2	6	33%
Cadillac	3	2	5	40%
Chevy	11	20	31	65%
Chrysler	1	1	2	50%
Dodge	3	2	5	40%
Ford	2	7	9	78%
Geo	0	1	1	100%
GMC	0	1	1	100%
Honda	3	1	4	25%
Lincoln	3	2	5	40%
Mazda	1	0	1	0%
MB	0	1	1	100%
Mercedes	1	0	1	0%
Mercury	2	1	3	33%
Mitsu	0	1	1	100%
Nissan	2	1	3	33%
Olds	4	3	7	43%
Plymouth	1	2	3	67%
Pontiac	1	5	6	83%
Saturn	2	0	2	0%
Toyota	2	0	2	0%
Total	**47**	**53**	**100**	**53%**

1. IM93 Screening Effectiveness

ESC examined the second-by-second emissions to look for patterns indicating evaporative leaks. Regressions of HC vs. CO and CO2 were calculated and plotted for each vehicle. A positive HC offset in the regression indicates the average level of HC when CO or CO2 are zero.

The HC vs. CO regression breaks down when CO is zero, which is not uncommon. Therefore, attention was focused on the HC vs. CO2 regression offset.

HC was also plotted separately and averaged for periods when CO2 was low. Figure III-3 shows an example set of results for the Mustang mentioned above. The first section provides vehicle information, an evaporative leak prediction, average HC and CO emissions, and some statistical results from the second-by-second data. The HC and CO g/mi emissions are the average over both 93-second cycles combined. These

are different from the emissions shown on the inspection report. The reported emissions are the average over just the second IM93 cycle.

A more or less constant level of HC is evident in the first chart in Figure III-3. The second chart shows significant levels of HC during sections of the test when when the engine is producing little power and CO2 is low. The regressions of HC vs. CO and HC vs. CO2 have positive HC offsets suggesting HC is emitted when there is no CO2. These are all indicators that point to the presence of evaporative emissions.

A preliminary evaporative leak prediction equation was created where a leak is suspected if:

[(HC vs. CO2 Offset g/sec) - 0.0001 * (IM93 CO g/mi)] > 0.005

This equation provided mixed results when applied to the vehicle sample (90 sets of second-by-second results were evaluated). Table III-5 shows the results. Note that:

- About half the vehicles were found to have evaporative emissions [(22 + 21)/90]
- Slightly less than half (42%) of the vehicles evaluated were predicted to have evaporative emissions [(22 + 16)/90].
- Half the vehicles with evaporative emissions were not predicted [(21/(22+21)].

Results were better for vehicles registering larger ppm values on the MiniRAE detector. Twenty-four of the vehicles in the 90-vehicle sample had measured MiniRAE 2000 ppm levels. Based on these ppm levels, the prediction algorithm correctly identified 70% of the evaporative emissions.

Table III-5 IM93 Leak Prediction Results

IM93 Prediction	Inspections
Correctly predict no evaporative emissions	31
Correctly predict evaporative emissions	22
Incorrectly predict no evaporative emissions	21
Incorrectly predict evaporative emissions	16
Total	90

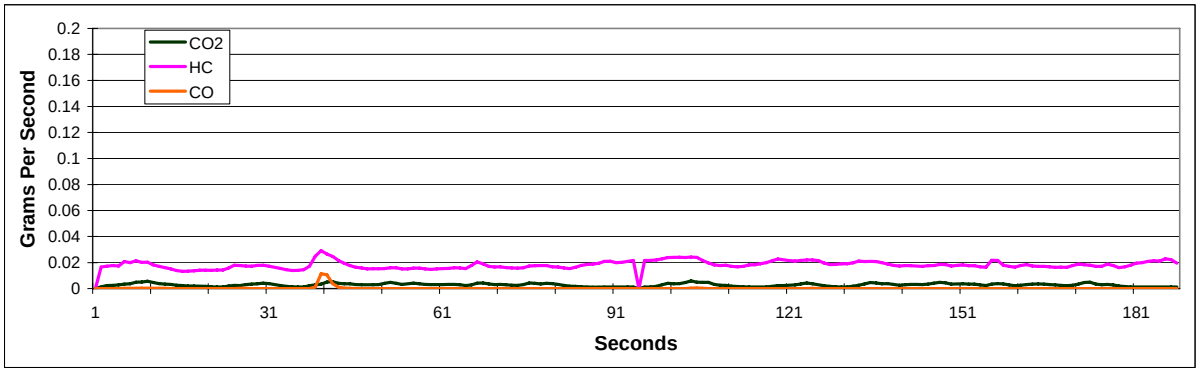
Additional results should help to refine the prediction algorithm and strike the correct balance between selecting too many vehicles for the leak inspection vs. failing to select some vehicles with evaporative emissions.

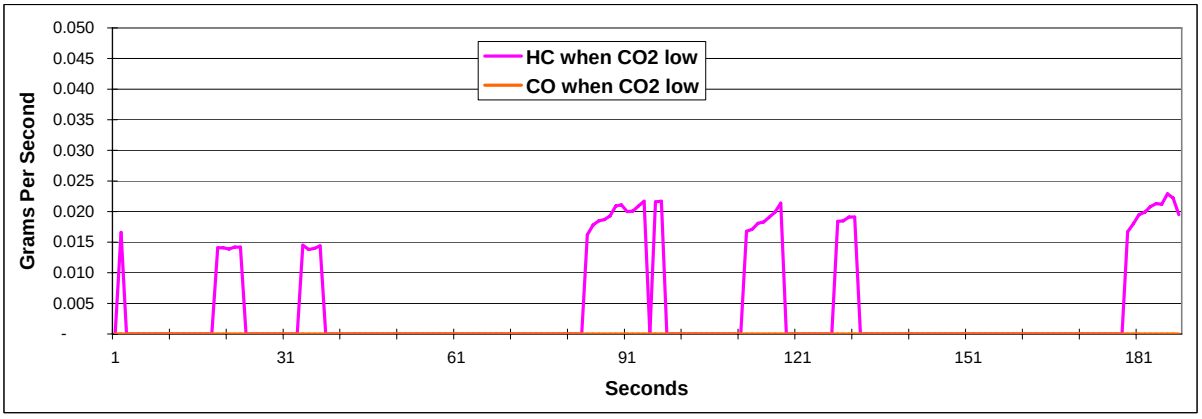
Table III-6 lists the vehicles examined and the leaks identified. Appendix C contains the second-by-second emissions and HC vs. CO2 regressions.

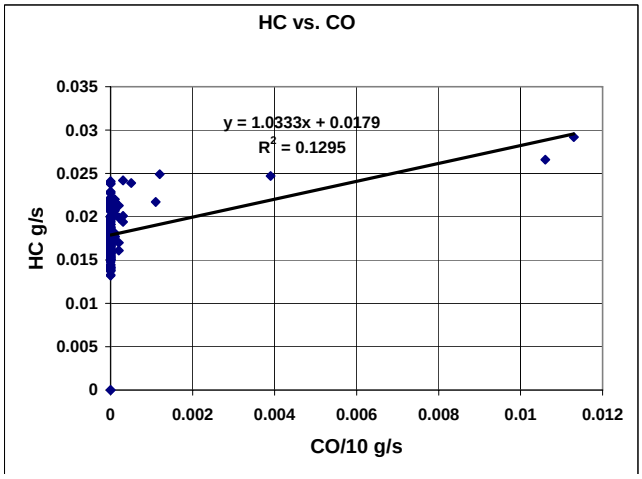
Figure III-3 Example Analysis of IM93 Second-by-Second Results

Ref: 39				**Leak predicted:**	**Yes**
Cert: 3003593	**VIN: 1FACP42E3MF179491**		**Make: FORD**		
Year: 1991	**Model: MUSTAN**		**HC g/mi:**	**2.99**	
	HCLP: Yes		**CO g/mi:**	**0.27**	
	Note: tank line at canister disconnected. Reconnected = pass				

Avg HC when CO2 low g/s:		**0.018**	**Stdev %:**	**21%**	**Avg HC-$HC_{CO:}$**	**0.018**	
HC vs. CO:	**A:**	**1.03**	**B:**	**0.018**	**R^2:**	**0.13**	**Stdev HC-$HC_{CO:}$** **0.003**
HC vs. CO2	**A:**	**0.83**	**B:**	**0.016**	**R^2:**	**0.08**	**Stdev HC-$HC_{CO2:}$** **0.003**







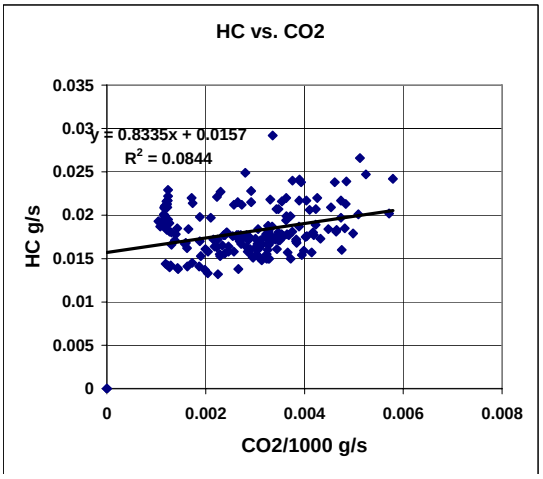


Table III-6 Leak Inspection Results

IM93 Second-by-second prediction

Ref Number	Date	VIN 4	Year	Make	Model	VIR	Leak or Vapor	Under Body or Under Hood	Comment	Bach lts	RAE ppm	Sec-By Sec	Ref	Correct Pass Pred	Correct Fail Pred	Missed Fail	False Fail
1	7/24/2007	5835	1991	Ford	Probe	3025912	Yes	Y	leak at fuel rail dampner	10		Yes	1			1	
2	7/26/2007	5890	1988	Ford	Escort	3026386	Yes	Y	leak at tank seam & misfire (vin on test set to 5600)	4		Yes	2		1		
3	8/8/2007	5596	1993	Saturn	SC	3028818	No					Yes	3	1			
4	8/8/2007	7117	1993	Buick	Regal	3028810	Yes	Y	leak at canister hoses RR fender			Yes	4			1	
5	8/13/2007	4893	1995	Pontiac	Firebird	2911477	Yes	Y	from repair advisor diagnosis			Yes	5		1		
6	8/13/2007	0176	1991	Chevy	Corvette	2938521	Yes	Y	from repair advisor diagnosis			Yes	6		1		
7	8/13/2007	9942	1991	Chevy	Camaro	2991705	Yes	Y	from repair advisor diagnosis			Yes	7		1		
8	8/13/2007	9231	1991	Pontiac	Firebird	2975555	Yes	Y	from repair advisor diagnosis			Yes	8		1		
9	8/13/2007	8695	1991	Chevy	Camaro	3025656	Yes	Y	from repair advisor diagnosis			Yes	9		1		
10	8/14/2007	2826	1989	Chevy	Cavalier	3026827	Yes	Y	response under middle of car - difficult to find. After RA run, wet gas line leak at frame rail near driver door		30	Yes	10		1		
11	8/14/2007	0240	1993	Dodge	Intrepid	3008952	No					Yes	11	1			
12	8/14/2007	8976	1993	Chrysler	LeBaron	3033634	No					Yes	12	1			
13	8/14/2007	4649	1991	Buick	LeSabre	3007174	No					Yes	13	1			
14	8/14/2007	2504	1987	Olds	Cutlass	3027683	Yes	Y	slight response at carb and canister - (early 70s open loop carb'd Pontiac engine)			Yes	14		1		
15	8/14/2007	7938	1995	Olds	Cutlass	3028993	Yes	Y	response at canister hoses LR fender	1	200	Yes	15			1	
16	8/14/2007	3009	1993	Chevy	Astro	3028999	No					Yes	16	1			
17	8/14/2007	8294	1992	GMC	Yukon	3027706	Yes	Y	slight odor at rear - no response. Slight response near TBI - air cleaner mia			No	17				
18	8/14/2007	0429	1989	Mazda	MX6	2983144	No					Yes	18	1			
19	8/14/2007	7441	1995	Ford	F150	3029018	No					Yes	19				1
20	8/14/2007	7488	1992	Buick	Roadmaster	2916416	No					Yes	20	1			
21	8/14/2007	4208	1983	Lincoln	Town Car	3029021	Yes	G	significant leak at gas cap - very high pressure on removal. Cracks at edge of gasket - cap seals near edge on vehicle. Cap passed ck probably because adapter seals further in on cap gasket.	4	400	Yes	21			1	
22	8/14/2007	3895	1991	Chevy	C1500	2991708	Yes	Y	small leak at canister - LF undhd - clamp removed from line	1	9	No	22				
23	8/14/2007	8792	1993	Dodge	Stealth	3029027	Yes	Y	small response at gas cap and RR fender. Small response at intake by injectors.	1		Yes	23			1	
24	8/16/2007	7402	1993	Geo	Prism	3027271	Yes	G	small response at gas cap		20	No	24				
25	8/16/2007	1305	1992	Cadillac	Eldo	2908430	No					Yes	25	1			
26	8/16/2007	2679	1993	Plymouth	Aclaim	3033691	Yes	G	small response at gas cap		8	Yes	26		1		
27	8/16/2007	4067	1992	Chevy	Malibu	2922333	No					Yes	27				1
28	8/17/2007	2205	1995	Dodge	Intrepid	2620603	Yes	Y	small response at RS intake manifold - no odor	1		Yes	28			1	
29	8/21/2007	4595	1993	Ford	Escort	2939255	Yes	F	response at tank fill - behind neck trim		28-54	Yes	29			1	
30	8/21/2007	4972	1985	Buick	LeSabre	3003907	Yes	Y	response at air cleaner		8-15	No	30				
31	8/21/2007	6624	1991	Honda	Civic	2911453	No					Yes	31	1			

Table III-6 Leak Inspection Results

IM93 Second-by-second prediction

Ref Number	Date	VIN 4	Year	Make	Model	VIR	Leak or Vapor	Under Body or Under Hood	Comment	Bach lts	RAE ppm	Sec-By Sec	Ref	Correct Pass Pred	Correct Fail Pred	Missed Fail	False Fail
32	8/21/2007	9722	1995	Ford	Probe	2906692	No					Yes	32				1
33	8/21/2007	4934	1987	Cadillac	Brougham	2917502	No					Yes	33	1			
34	8/21/2007	9904	1991	Olds	Cutlass	2910672	No					Yes	34	1			
35	8/21/2007	6898	1994	Nissan	Altima	3028047	Yes	G	gas cap neck		20-40	Yes	35			1	
36	8/21/2007	3097	1989	Honda	Accord	3002964	Yes	F	tank fill tube to hose - wet		40-85	Yes	36		1		
37	8/21/2007	4626	1993	Chevy	Camaro	2916569	Yes	F	fuel fill neck / LS tank		20-60	Yes	37		1		
38	8/21/2007	4779	1987	Cadillac	DeVille	3026785	Yes	G	gas cap (20-150) wrong cap? Replaced w/10817. at air cleaner (10-20)		20-150	Yes	38			1	
39	8/21/2007	9491	1991	Ford	Mustang	3003593	Yes	Y	tank line at canister disconnected. Reconnected = pass		500+	Yes	39		1		
40	8/22/2007	8042	1991	Honda	Accord	3035080	No					Yes	40	1			
41	8/22/2007	2406	1993	Chevy	Cavalier	3035097	Yes	Y	R center - fuel filter area		10-50	Yes	41			1	
42	8/22/2007	4084	1995	Chevy	van	3028146	No					Yes	42				1
43	8/22/2007	9762	1987	Chevy	Impala	3028155	Yes	Y	air cleaner		10	No	43				
44	8/23/2007	4009	1993	Chrysler	Concorde	3015053	Yes	Y	left bank - cyl 4,6 at injector rail	4	1500+	Yes	44		1		
45	8/23/2007	7821	1993	Chevy	Cavalier	2617149	No					Yes	45	1			
46	8/23/2007	5700	1994	Chevy	van	2911280	Yes	Y	air cleaner snorkel		80-170	No	46				
47	8/28/2007	6543	1995	Chevy	Blazer	2916747	No					Yes	47				1
48	8/28/2007	5701	1991	Buick	Park Ave	2922800	No					Yes	48				1
49	8/28/2007	7195	1994	Toyota	4RNR	2916755	No					Yes	49				1
50	8/28/2007	0051	1991	Chevy	Camaro	3029127	Yes	Y	LS tank / air cleaner	2	50-90	Yes	50			1	
51	8/28/2007	6903	1987	Toyota	Camry	3028767	No					Yes	51	1			
52	8/30/2007	8822	1991	Chevy	Caprice	3029433	No					Yes	52	1			
53	8/30/2007	9821	1991	Olds	Cutlass	3035661	No					Yes	53	1			
54	8/31/2007	8225	1995	Chevy	Corvette	3035763	Yes	Y	gas tank	1	40-125	No	54				
55	8/31/2007	3473	1987	Cadillac	Brougham	3035765	Yes	Y	air cleaner / canister	1		No	55				
56	8/31/2007	3001	1995	Chevy	Tahoe	3029517	Yes	Y	canister		40-238	No	56				
57	8/31/2007	8481	1985	MB	500SEL	3035783	Yes	Y	gas cap / under hood response near grille - couldn't zero in. when car left, found 3" dia. spot behind where LF tire was - probably fuel line leak.	1/1	6-9	No	57				
58	9/4/2007	6229	1987	Nissan	Maxima	3029640	No					Yes	58				1
59	9/4/2007	0345	1989	Pontiac	Sunbird	3031654	Yes	F	response at filler neck	1		Yes	59			1	
60	9/4/2007	1284	1993	Chevy	van	3029654	No					Yes	60				1
61	9/5/2007	3064	1993	Lincoln	TC	3031682	No					Yes	61	1			
62	9/5/2007	3028	1993	Mercury	Villager	3031685	Yes	Y	LS of fuel tank	10	163	Yes	62		1		
63	9/5/2007	4216	1995	Chevy	Cavalier	3029680	Yes	Y	tank filler neck / at throttle body area	1/1	6-10	Yes	63			1	
64	9/5/2007	4928	1995	Mercury	Cougar	3030017	No					Yes	64	1			
65	9/5/2007	6774	1993	Ford	Tempo	3029685	Yes	Y	at tank fill / top of tank	2/3	17	Yes	65		1		
66	9/5/2007	4282	1993	Olds	Cutlass	2922718	No					Yes	66				1
67	9/6/2007	1662	1993	Plymouth	Duster	2910506	No					Yes	67	1			
68	9/6/2007	8317	1983	Chevy	van	3030131	No					Yes	68				1

Table III-6 Leak Inspection Results

IM93 Second-by-second prediction

Ref Number	Date	VIN 4	Year	Make	Model	VIR	Leak or Vapor	Under Body or Under Hood	Comment	Bachlts	RAE ppm	Sec-By Sec	Ref	Correct Pass Pred	Correct Fail Pred	Missed Fail	False Fail
69	9/6/2007	4948	1985	Ford	F150	3030132	Yes	F	filler neck	1		Yes	69		1		
70	9/6/2007	9275	1995	Mitsu	Esclipse	3030134	Yes	Y	top of fuel tank RR	10		Yes	70			1	
71	9/6/2007	2679	1993	Plymouth	Aclaim	3033691	Yes	Y	fuel sender on tank wet		133	Yes	71		1		
72	9/10/2007	6784	1995	Pontiac	Firebird	2922592	Yes	Y	fuel tank top	2		Yes	72			1	
73	9/10/2007	8493	1995	Chevy	Camaro	3035887	Yes	Y	fuel tank top	3	105	Yes	73		1		
74	9/10/2007	4479	1995	Chevy	Cavalier	2906999	No					Yes	74	1			
75	9/11/2007	6810	1991	Chevy	Caprice	3030420	No					Yes	75	1			
76	9/11/2007	2279	1993	Cadillac	DeVille	3035935	No					Yes	76	1			
77	9/11/2007	5247	1986	Olds	Cutlass	3035945	No					Yes	77				1
78	9/11/2007	1824	1991	Pontiac	Transport	3030456	No					Yes	78				1
79	9/11/2007	6866	1987	Chevy	Corvette	3030491	Yes	Y	fuel tank top / injector rail both sides	1 / 1		Yes	79		1		
80	9/11/2007	4021	1991	Chevy	1500	3017531	Yes	Y	fuel tank top		22-30	Yes	80			1	
81	9/11/2007	4008	1991	Dodge	Daytona	2922930	No					Yes	81	1			
82	9/11/2007	5708	1995	Buick	Century	3017394	No					Yes	82				1
83	9/11/2007	1585	1989	Chevy	Beretta	3017561	Yes	Y	R/S engine near steering pump		30-40	Yes	83			1	
84	9/11/2007	3133	1993	Saturn	SL	3017575	No					Yes	84	1			
85	9/11/2007	9778	1993	Lincoln	TC	2956435	No					Yes	85	1			
86	9/11/2007	5482	1993	Dodge	Intrepid	3035804	No					Yes	86	1			
87	9/11/2007	9020	1987	Olds	Firenza	3017593	Yes	F	filler neck		8-9	Yes	87		1		
88	9/11/2007	5966	1995	Chevy	Blazer	3016273	No					Yes	88				1
89	9/11/2007	1442	1989	Pontiac	Firebird	3016277	Yes	Y	filler neck / fuel tank top		355	Yes	89		1		
90	9/12/2007	7984	1993	Nissan	Altima	3030557	No					Yes	90	1			
91	9/12/2007	1063	1995	Ford	Escort	3030568	Yes	Y	fuel tank top	1		Yes	91			1	
92	9/12/2007	3327	1993	Mercury		3030569	No		(oil burner)			Yes	92	1			
93	9/12/2007	5155	1993	Chevy	Cavalier	3030574	Yes	Y	filler neck / fuel tank top	1 / 1		Yes	93			1	
94	9/12/2007	4501	1989	Lincoln	Continental	3030582	Yes	G	filler neck / fuel tank top - tighten cap - gone	1 / 1		Yes	94		1		
95	9/12/2007	9477	1993	Chevy	Cavalier	3030586	Yes	Y	canister	1		Yes	95			1	
96	9/12/2007	6023	1991	Honda	Accord	3031922	No					Yes	96	1			
97	9/12/2007	1336	1993	Lincoln	TC	3030590	No					Yes	97	1			
98	9/14/2007	7514	1995	Ford	PU	3030793	No					Yes	98	1			
99	9/14/2007	9304	1985	Mercedes	280SE	3030798	No					Yes	99				1
100	9/17/2007	2406	1993	Chevy	Cavalier	3030447	Yes	Y	rusted tank		500	Yes	100			1	
Total														31	22	21	16

IV. Voluntary Leak Inspection Implementation

Given the results of this pilot, ESC proposed to implement a voluntary network wide leak inspection of 1995 & older models failing the IM93 exhaust inspection for HC. The advantages of this are several:

1) It will help to identify and reduce evaporative emissions;
2) It helps motorists and technicians diagnose the source of HC emissions and reduces repair expense and ping-ponging between the repair shop and the inspection lane;
3) The pilot was well received by vehicle owners
4) It will provide additional data that may help extend the inspection program beyond 1995 & older models failing the IM93 exhaust inspection for HC, e.g. to vehicles with evaporative emissions that pass IM93 and to OBD vehicles with evaporative emissions.

V. Additional Work

The pilot study has validated the importance of looking for evaporative leaks but much work remains to be done to determine which vehicles should be inspected, to determine the best method of selecting vehicles for leak inspection and to quantify the benefits. A number of follow-on tasks are proposed:

- Leak inspections of a random sample of 1995 and older vehicles that pass the IM93 HC exhaust inspection. This will indicate if leak inspection of these vehicles is a cost effective option.
- Leak inspections of a random sample of OBD vehicles. These inspections will indicate the frequency of evaporative leaks in 10-11 year old OBD-II equipped vehicles. OBD-II evaporative monitoring systems should identify many evaporative system leaks but are not expected to detect liquid fuel leaks.
- Quantification of emissions leaks. Some means of roughly quantifying evaporative emissions leaks is highly desireable.
- Analysis of inspection results from the voluntary program.
- Follow-up and a reporting of evaporative emission repairs

Appendix A – Leak Inspection Procedure

Hydrocarbon Leak Inspection Procedure

The system will display a flag that states "further inspection required." This informs the inspector that the hydrocarbon leak inspection is required. The inspector will acknowledge this by pressing the green button.

Inspector B will then inform Inspector A to contact the manager on duty or call for the manager on duty themselves.

The lane inspector will then pull the vehicle from position 2 to position 3. Following all normal procedures (shutting the vehicle off, closing the door, etc.)

Upon vehicle being flagged for HCLP.
The lane inspector will then retrieve the customer from the wait booth and instruct them to have a seat in their vehicle. Follow all normal farewell procedures while waiting for the manager to arrive. Inspector will then state to the customer**:** "*Because of your vehicle's hydrocarbon readings, it qualifies for an additional inspection that may help identify the cause of the failure. My manager will be right here to discuss the details with you."*

Upon being notified of a flagged vehicle.
Manager: "*Your vehicle's hydrocarbon readings indicate that there may be a fuel or fuel vapor leak. I would like to perform an additional inspection on the vehicle to determine if there are any leaks that may be contributing to the excessive hydrocarbon readings. This additional inspection is free of charge and typically takes around 5 minutes. It may assist you or your technician in locating the problem and preventing more costly repairs as well as improve your vehicle's gas mileage."*

Upon the customer agreeing to the inspection, manager will say:
"Please pull your vehicle around to [direct customer to empty lane or waiver bay as appropriate]".

If the customer declines or wants more information, here are some talking points that may help influence their decision to participate:

- Hydrocarbon leaks are a safety hazard because of the highly flammable nature of fuel and fuel vapors

- Finding and fixing a leak will improve the vehicle's gas mileage because when a vehicles is leaking HC, the fuel is evaporating or leaking before the engine can burn it to power the vehicle. Essentially the customer is paying for fuel the car is not using.
- Hydrocarbon leaks are more harmful to the environment than tailpipe emissions because these emissions are completely unchecked by the vehicle's emission control system.
- By identifying a leak now, it may save money in repairs by providing the technician with this information up front.

If the customer continues to decline the inspection the manager will say:
"Thank you and have a nice day."

Prior to beginning the HC leak inspection.
Manager: *"Please turn the vehicle off and open your gas door [if necessary] and open your hood for me. The customer should exit the vehicle and raise the hood. You can either have a seat back in your vehicle or watch the procedure from the wait booth."* If the owner stays in the vehicle they should be instructed to remove the keys from the ignition. *"I'll be using a hydrocarbon detector to see if I can find any areas of concern."* The manger will need to ensure that the rear bay door is closed and that the overhead fan and fan cart are in the off position. You should try to position the vehicle where the wait booth can as serve as a barrier from the wind. In inclement weather the inspection will need to be performed in the waiver bay.

As you begin sniffing around the vehicle you will need to keep a close eye on the display screen while performing the procedure. This will inform you when the detector has found a possible leak. Any ppm reading higher than 4 indicates a possible leak but nothing less than 10 should be documented. You should then sniff around that area again to try and determine the PPM peak this is the reading that will be documented and given to the customer. The pace of movement for the detector should be on an average of one inch per second. Once you determine that there is a leak in this area the area should be marked on the HC notice along with the PPM peak. This is repeated for each section.

Inspection sequence*:*

Step one:
As you begin inspecting underneath the hood you want to visually divide it into four sections. Then point the detector towards the components under the hood. The pace of movement for the sniffer should be on an average of one inch per second for all steps. Your readings for all steps should be recorded after that section has been completed. If there are no findings place a line through the section.

Step two:
Take the detector and sniff around the fuel neck.

Step three:

Take the detector and sniff around the side of the vehicle that the gas cap is on. You will need to hold the end of the detector as close to the underneath of the vehicle as possible.

Step four:
Take the detector and sniff around the opposite side of the vehicle. Again you will need to hold the detector as close to the underneath of the vehicle as possible.

Step five:
Take the detector and sniff around the rear of the vehicle. Remaining as close to the underneath of the vehicle as possible.

If no potential leaks are identified.
Manager: *"I was not able to detect any fuel or fuel vapor leaks. Thank you for taking a few extra minutes to allow me to check. Back out safely and have a nice day."*

If a potential leak(s) is identified.
Manager: *"I was able to detect excessive hydrocarbons in the general areas I have marked on this diagram [show customer diagram]. It is possible that this is contributing to your vehicle's failure and this could help your technician address the problem."*

After you have completed the inspection and informed the customer of your findings you will need to staple the carbon copy onto their RDF and inform the customer that whoever completes the repairs will need to complete both the RDF and the Technician box on the HC Inspection form. Then enter the results into SISM. (Refer to SISM uploading instructions.)

Vehicle returns:

1. When the vehicle returns the HC inspection form should be attached to the repair data form completed by the person who performed the repairs. If the form is not completed please ask the customer if they have receipts and then transfer the findings onto the HC inspection form. If the customer does not have any receipts they should complete the form to the best of their knowledge.

2. The vehicle should be retested as normal, in the event the vehicle fails and is flagged for the HC leak inspection the vehicle should undergo the same procedures as before along with instructions to contact the hotline to make an appointment with the Repair Advisor if they want additional assistance. If it is not flagged for the HC leak procedure it should follow all normal testing procedures and farewell.

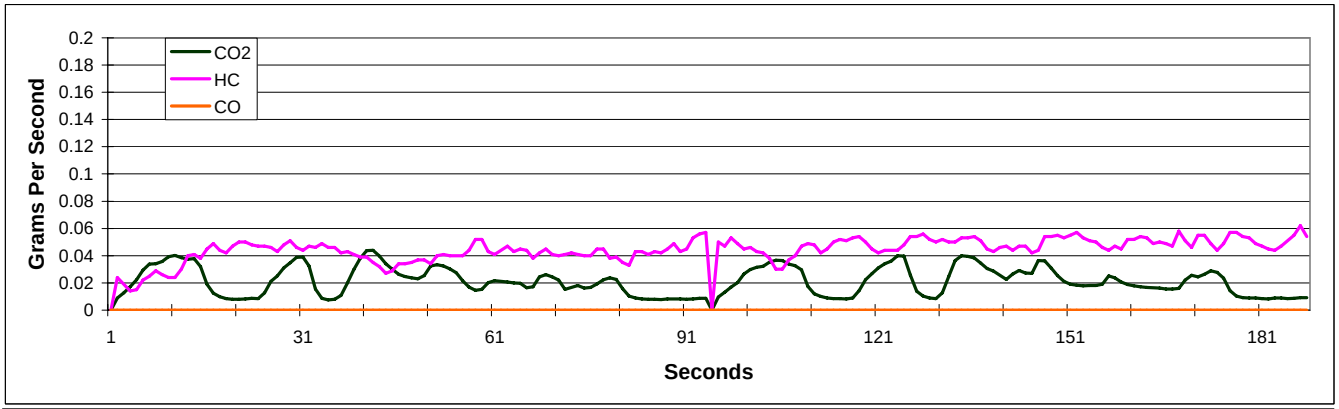
3. When you upload your RDF's you will also need to upload the information for the HC leak forms. (Refer to SISM uploading instructions)

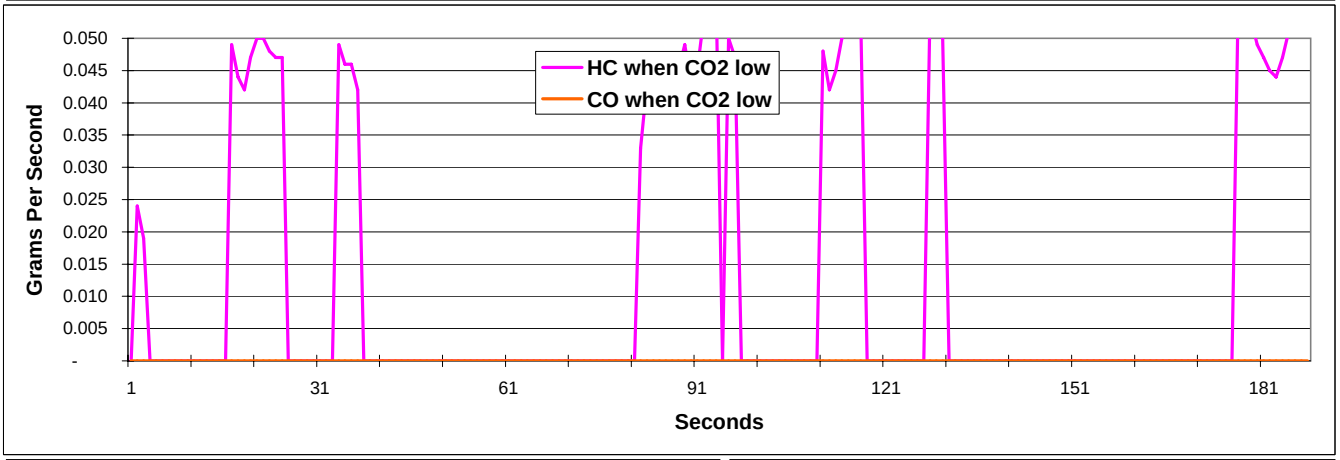
Appendix B – Simulated Leak Inspection Results

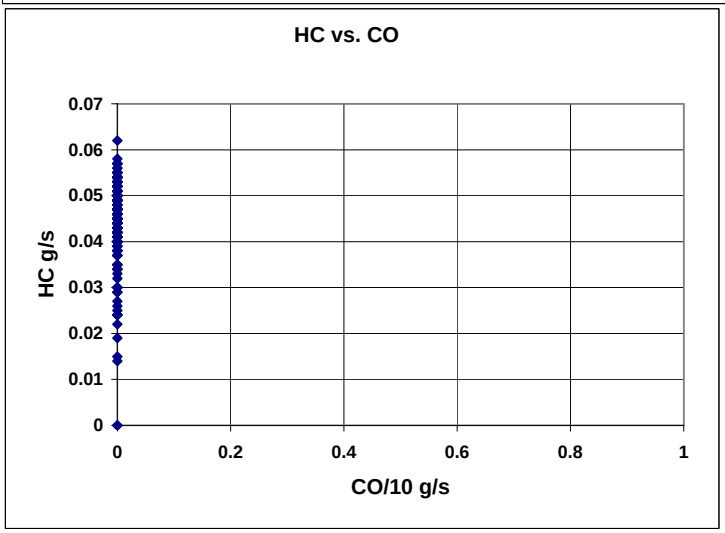
Ref: 200				**Leak predicted:**	Yes
Cert: 3026428	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	7.34
	HCLP: simulated			**CO g/mi:**	-

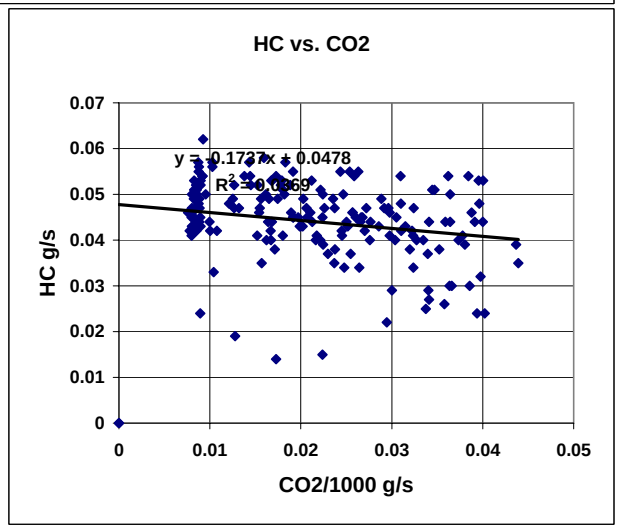
Note: Center flowing 5 SCFH 2 Hose Sample

Avg HC when CO2 low g/s:	0.047	**Stdev %:**	18%	**Avg HC-HC$_{CO_2}$**	#DIV/0!				
HC vs. CO:	**A:** #DIV/0!		**B:**	#DIV/0!	**R^2:**	#DIV/0!	**Stdev HC-HC$_{CO_2}$**	#DIV/0!	
HC vs. CO2	**A:**	(0.17)	**B:**	0.048	**R^2:**	0.04	**Stdev HC-HC$_{CO_2}$**	0.008	



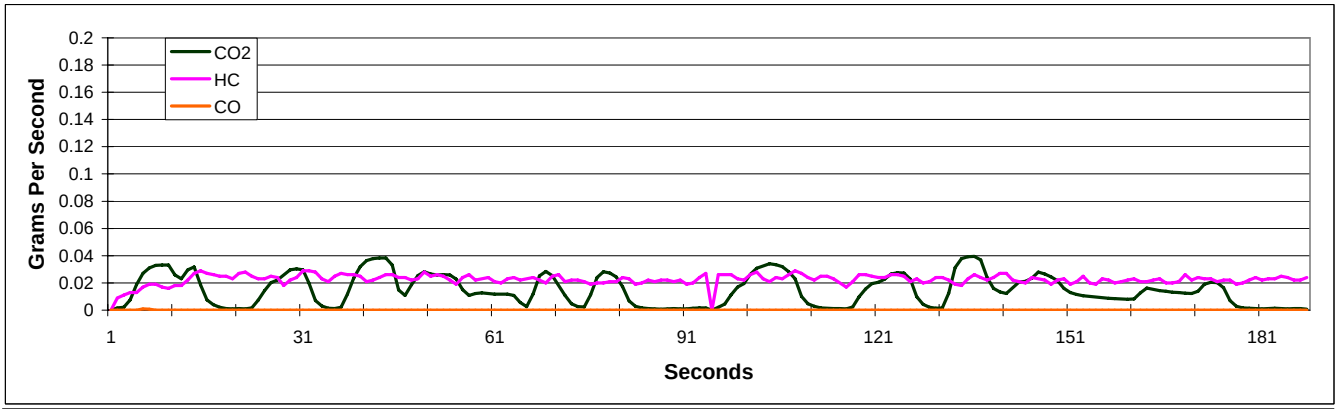


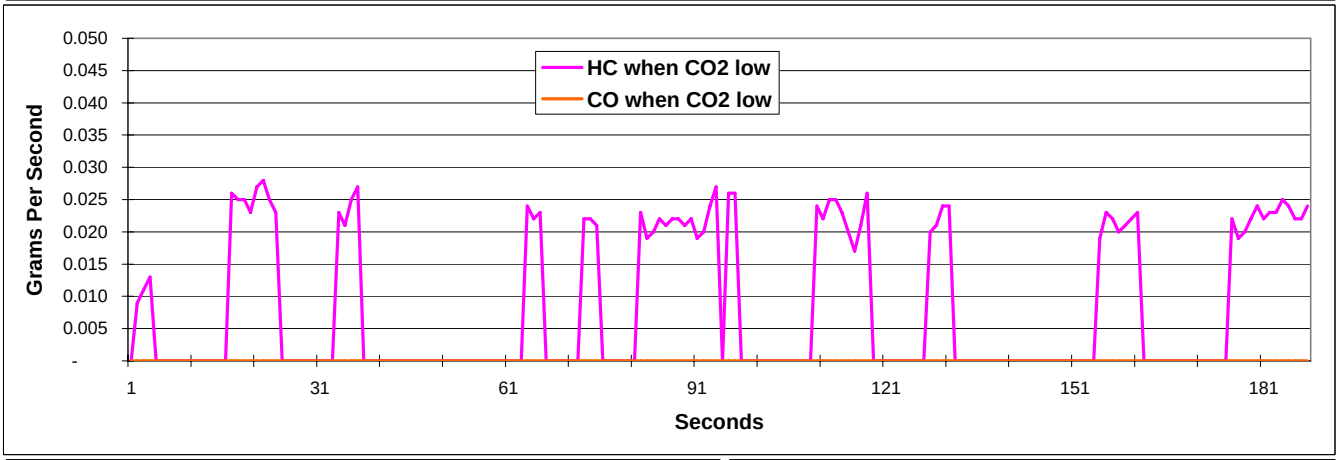


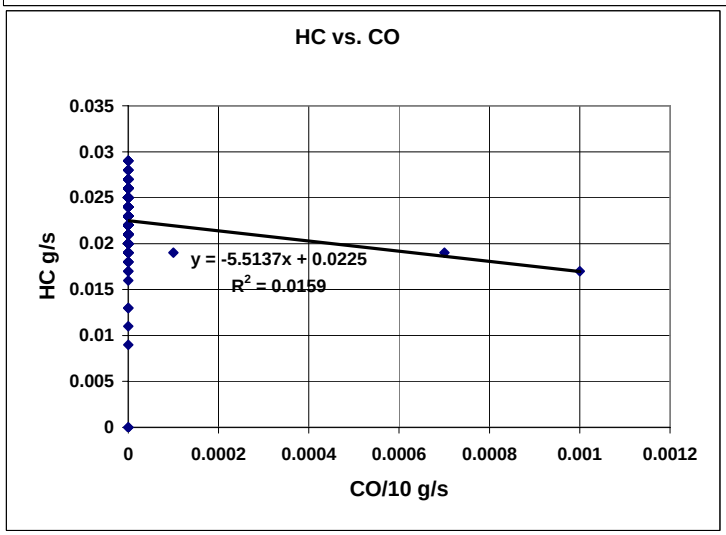


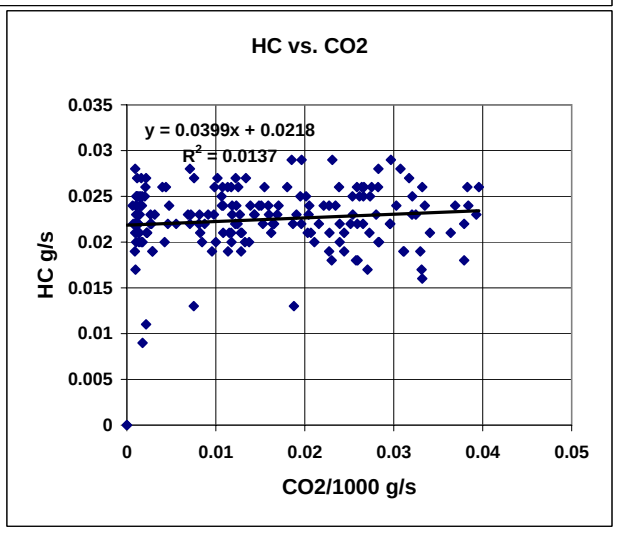
Ref: 201				**Leak predicted:**	Yes
Cert: 3026429	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	3.73
	HCLP: simulated			**CO g/mi:**	0.02
	Note: Center flowing 2 SCFH 2 Hose Sample				

Avg HC when CO2 low g/s:		**0.022**	**Stdev %:**	**16%**	**Avg HC-$HC_{CO:}$**	**0.022**	
HC vs. CO:	**A:**	**(5.51)**	**B:**	**0.022**	**R^2:**	**0.02**	**Stdev HC-$HC_{CO:}$** **0.004**
HC vs. CO2	**A:**	**0.04**	**B:**	**0.022**	**R^2:**	**0.01**	**Stdev HC-$HC_{CO2:}$** **0.003**



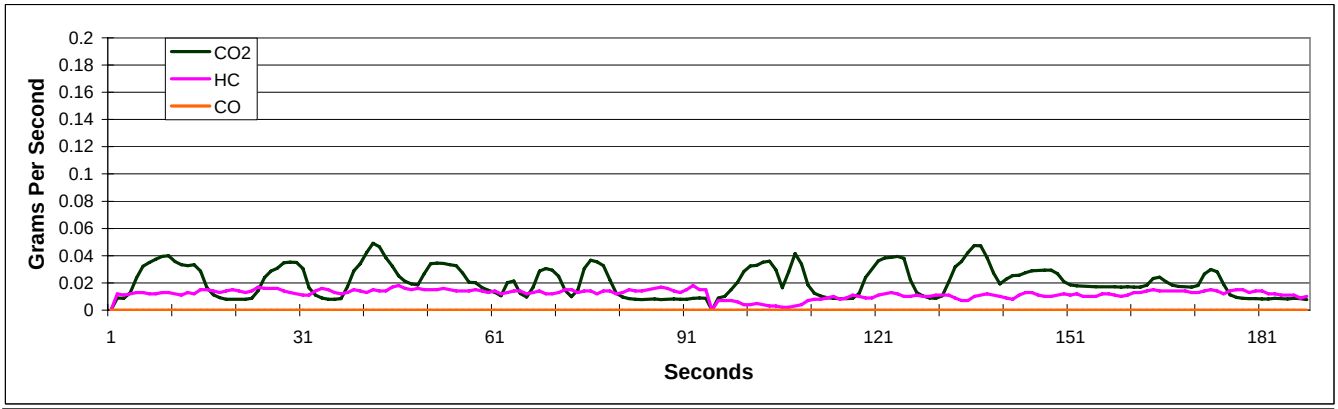


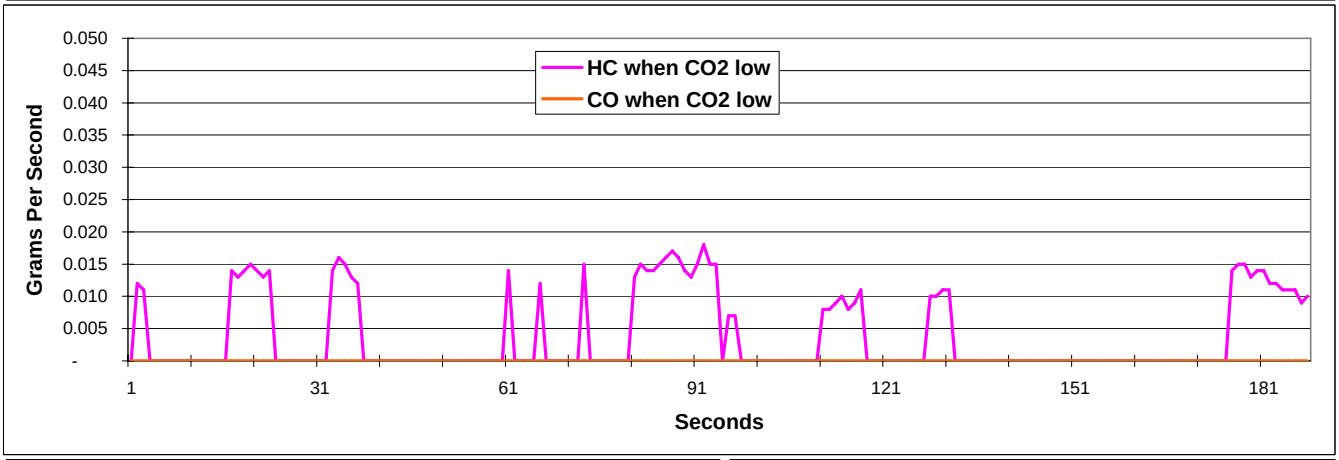


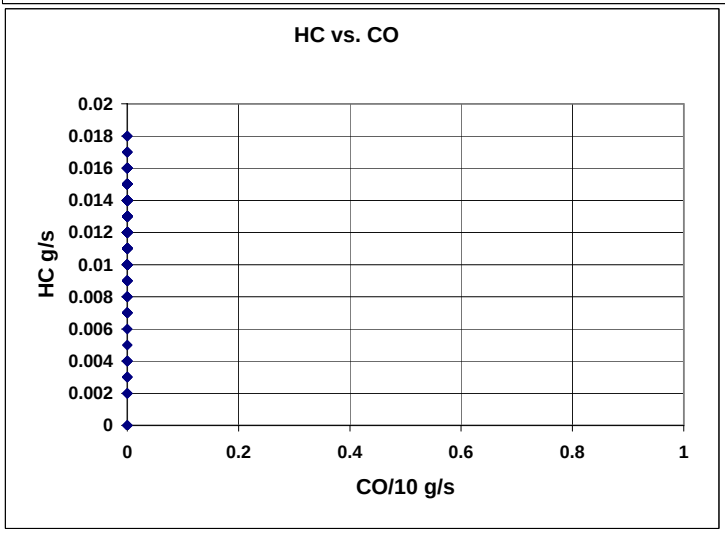


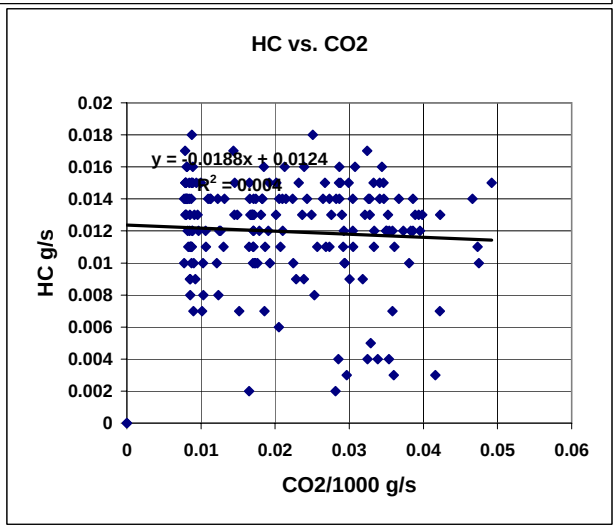
Ref: 202				**Leak predicted:** Yes	
Cert: 3026431	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	2.00
	HCLP: simulated			**CO g/mi:**	-
	Note: R/F Underhood 2 SCFH Into Fender 2 Hose Sample				

Avg HC when CO2 low g/s:	0.012	**Stdev %:**	25%	**Avg HC-HC$_{CO_2}$:**	#DIV/0!				
HC vs. CO:	**A:** #DIV/0!		**B:**	#DIV/0!	**R^2:**	#DIV/0!	**Stdev HC-HC$_{CO_2}$:**	#DIV/0!	
HC vs. CO2	**A:**	(0.02)	**B:**	0.012	**R^2:**	0.00	**Stdev HC-HC$_{CO_2}$:**	0.003	



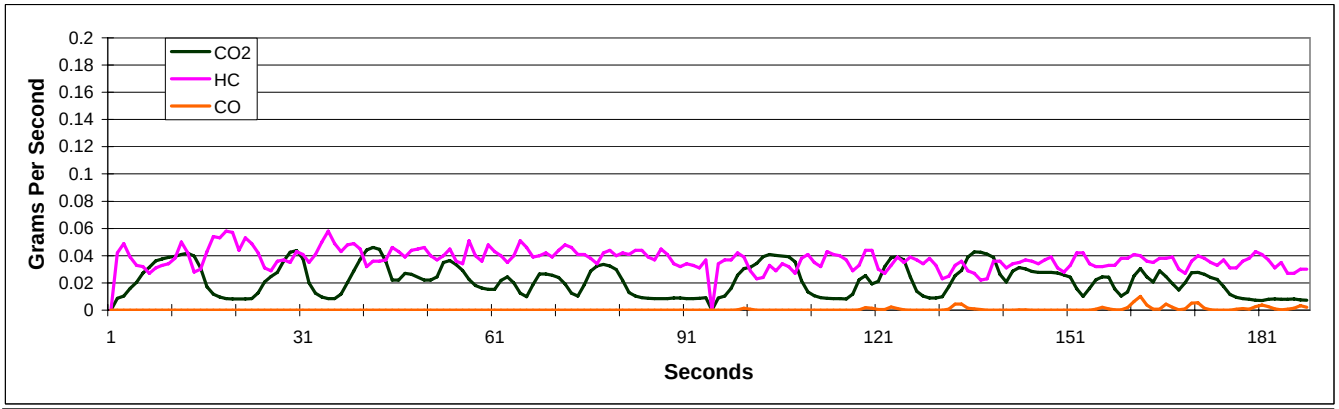


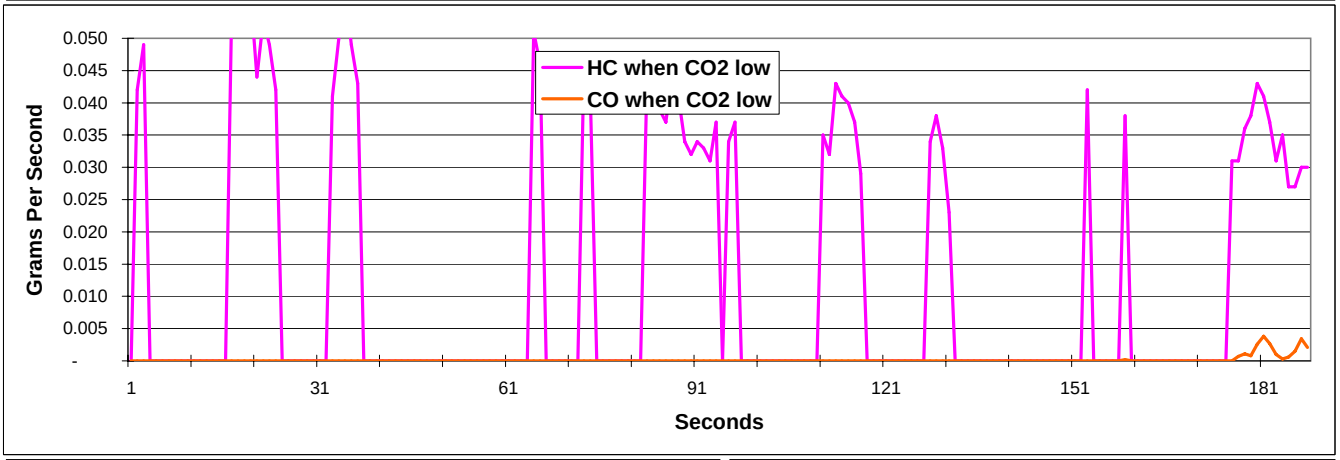


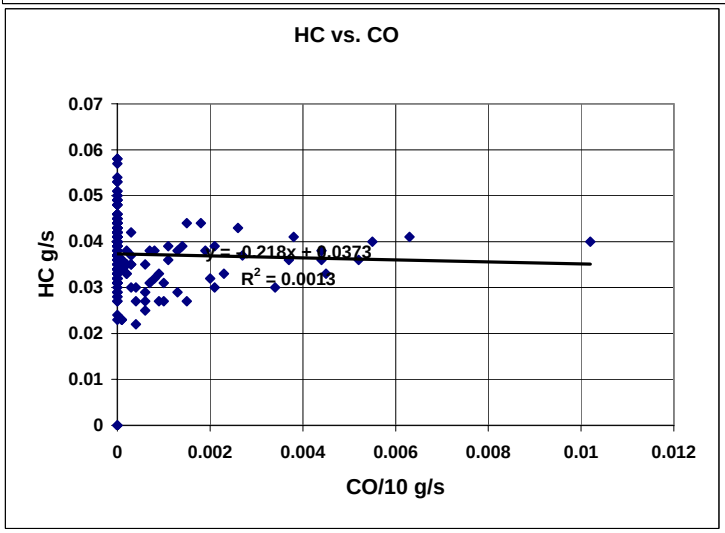


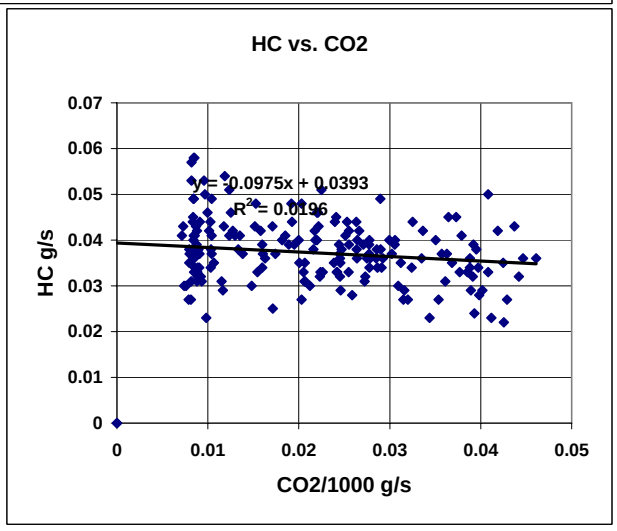
Ref: 203				**Leak predicted:** Yes	
Cert: 3026432	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	6.16
	HCLP: simulated			**CO g/mi:**	0.81
	Note: L/R Wheel 2 SCFH 2 Hose Sample				

Avg HC when CO2 low g/s:	0.039	**Stdev %:**	25%	**Avg HC-$HC_{CO:}$**	0.037		
HC vs. CO:	**A:** (0.22)	**B:**	0.037	**R^2:**	0.00	**Stdev HC-$HC_{CO:}$**	0.008
HC vs. CO2	**A:** (0.10)	**B:**	0.039	**R^2:**	0.02	**Stdev HC-$HC_{CO2:}$**	0.007



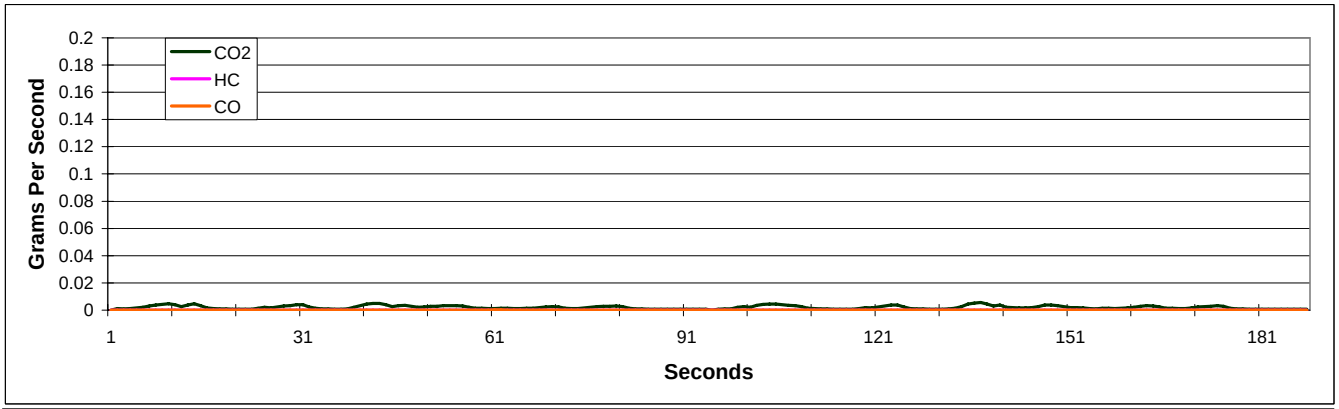


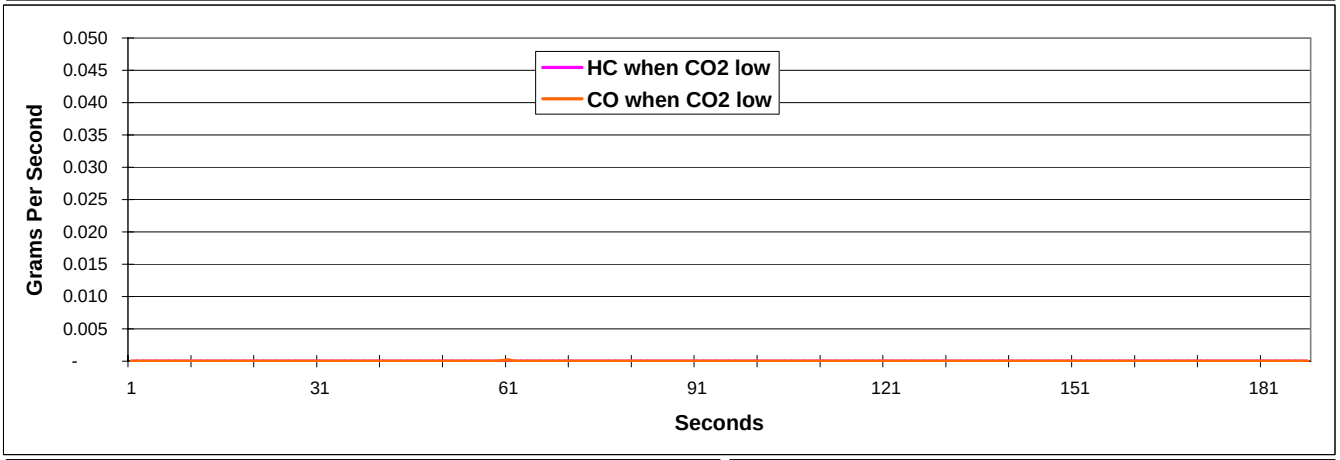


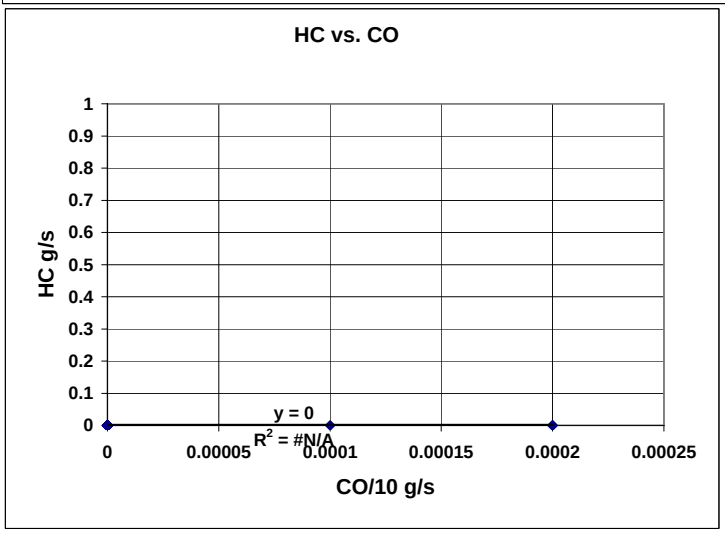


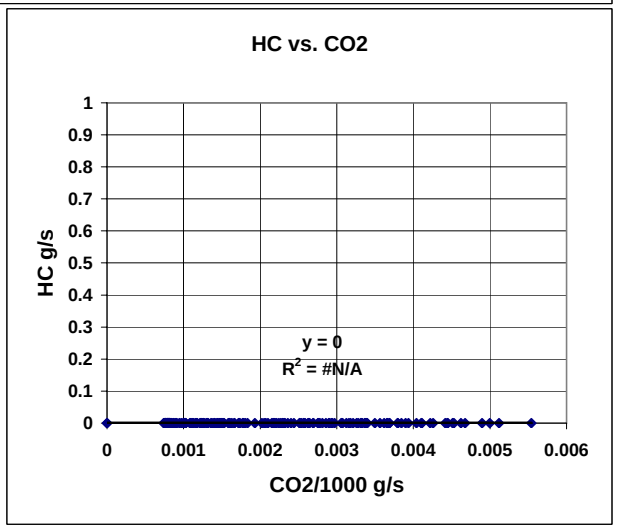
Ref: 210				**Leak predicted:** No	
Cert: 3007230	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	-
	HCLP: Plan B			**CO g/mi:**	0.00
	Note: baseline - no propane - data between traces - forced NOx failure				

Avg HC when CO2 low g/s:	-	**Stdev %:**	#DIV/0!	**Avg HC-HC_{CO2}:**	-			
HC vs. CO:	**A:**	-	**B:**	-	**R^2:**	#DIV/0!	**Stdev HC-HC_{CO2}:**	-
HC vs. CO2	**A:**	-	**B:**	-	**R^2:**	#DIV/0!	**Stdev HC-HC_{CO2}:**	-



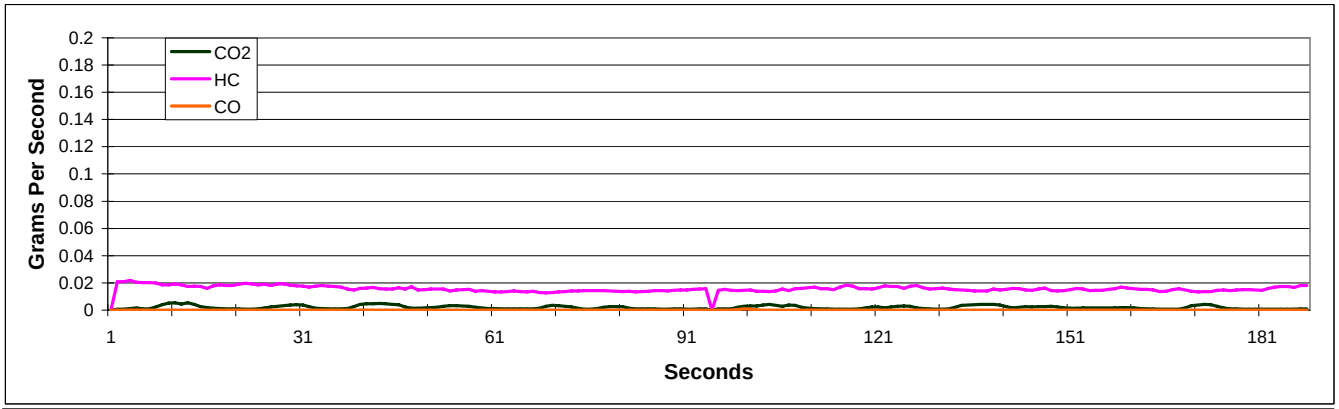


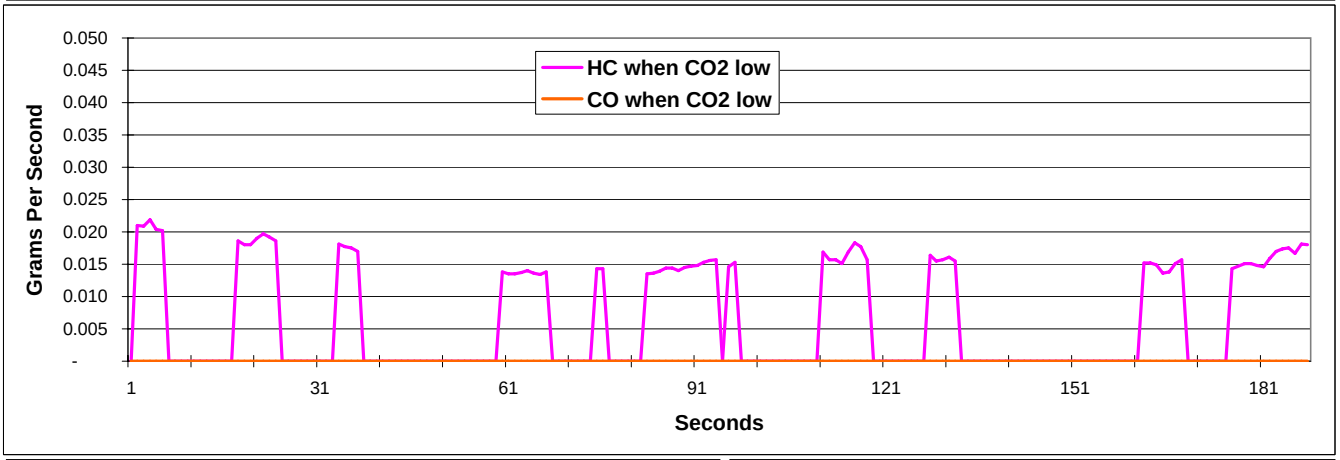


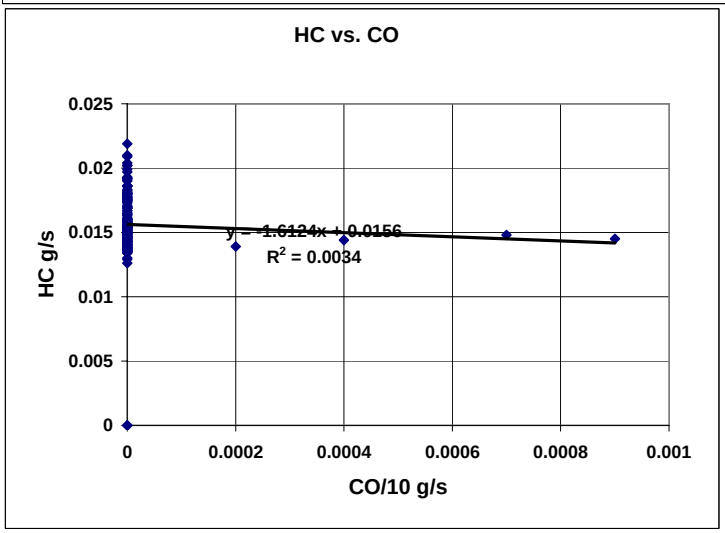


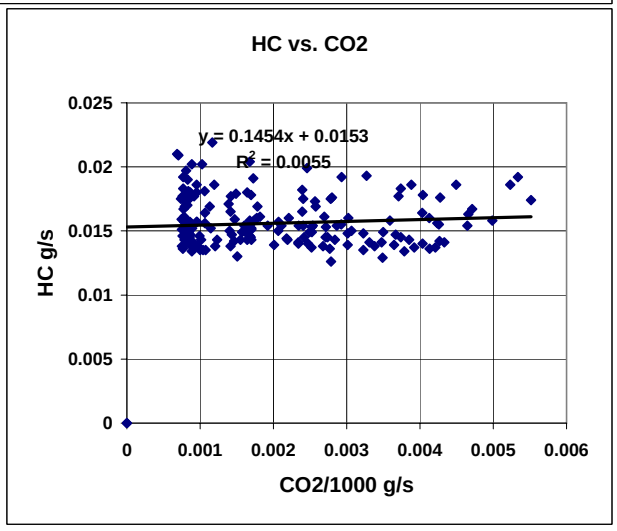
Ref: 211				**Leak predicted:** Yes	
Cert: 3007232	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	2.69
	HCLP: Plan B			**CO g/mi:**	0.02
	Note: propane on - engine idling between traces - 2 hoses at rear				

Avg HC when CO2 low g/s:		**0.015**	**Stdev %:**	**16%**	**Avg HC-HC$_{CO:}$**	**0.016**	
HC vs. CO:	**A:**	**(1.61)**	**B:**	**0.016**	**R^2:**	**0.00**	**Stdev HC-HC$_{CO:}$** **0.002**
HC vs. CO2	**A:**	**0.15**	**B:**	**0.015**	**R^2:**	**0.01**	**Stdev HC-HC$_{CO2:}$** **0.002**



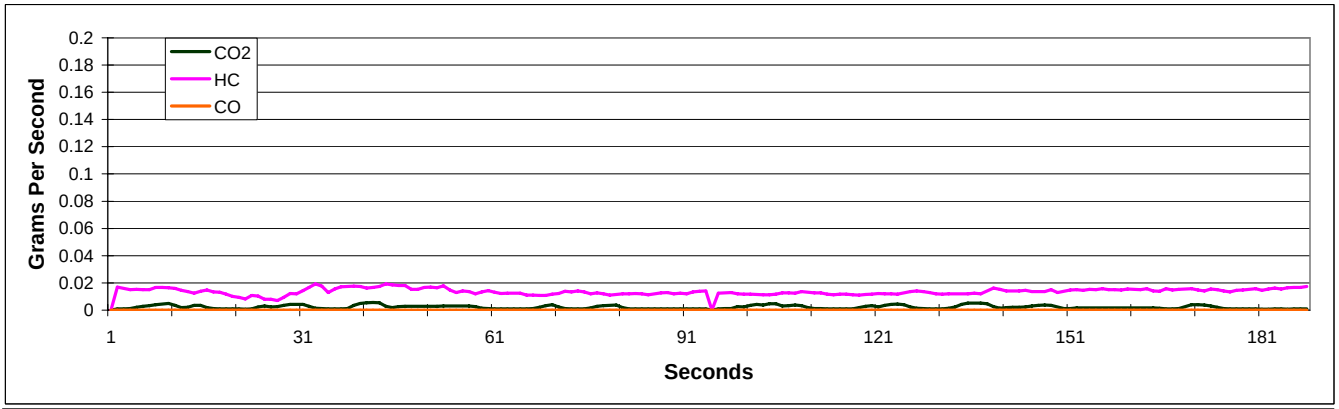


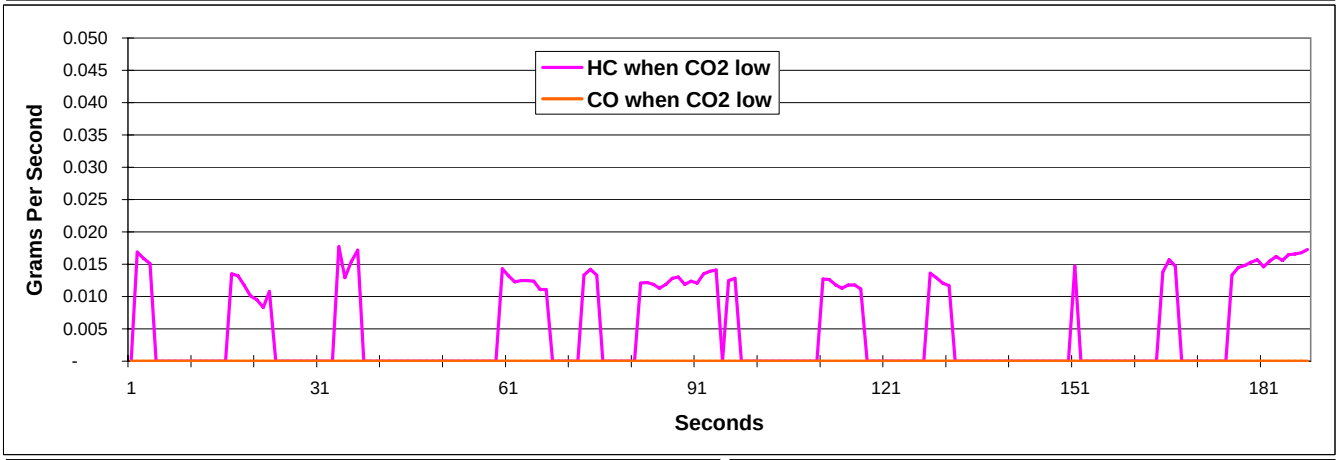


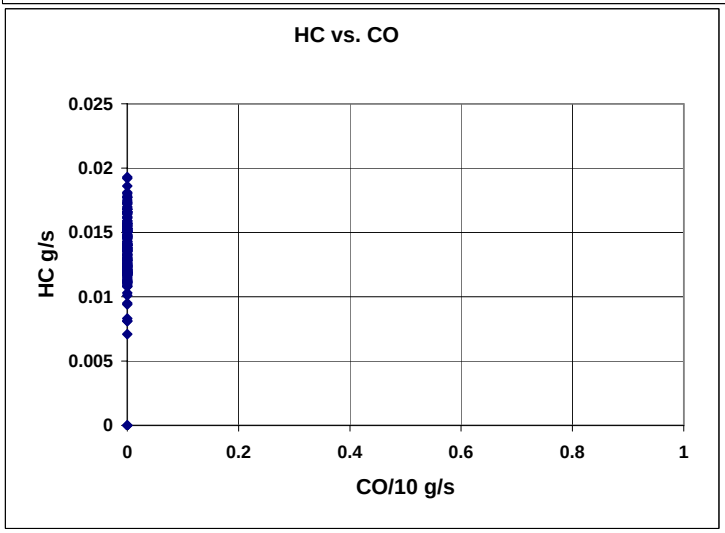


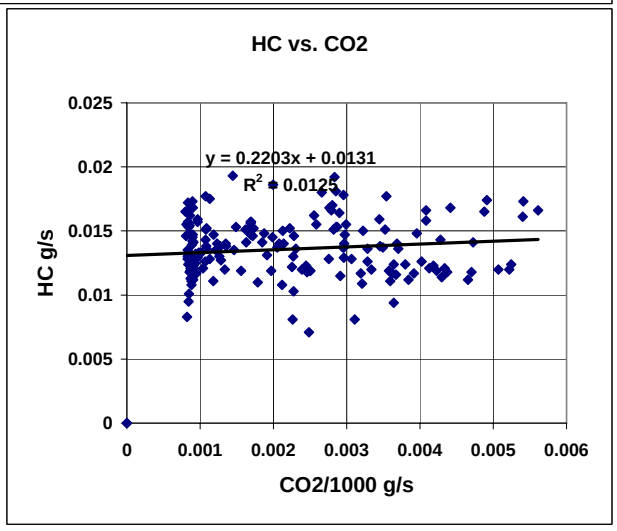
Ref: 212				**Leak predicted:** Yes	
Cert: 3007233	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	2.25
	HCLP: Plan B			**CO g/mi:**	-
	Note: propane on - engine off between traces - 2 hoses at rear				

Avg HC when CO2 low g/s:	0.013	**Stdev %:**	19%	**Avg HC-HC_{CO2}:**	#DIV/0!		
HC vs. CO:	**A:** #DIV/0!		**B:** #DIV/0!	**R^2:**	#DIV/0!	**Stdev HC-HC_{CO2}:**	#DIV/0!
HC vs. CO2	**A:** 0.22		**B:** 0.013	**R^2:**	0.01	**Stdev HC-HC_{CO2}:**	0.002



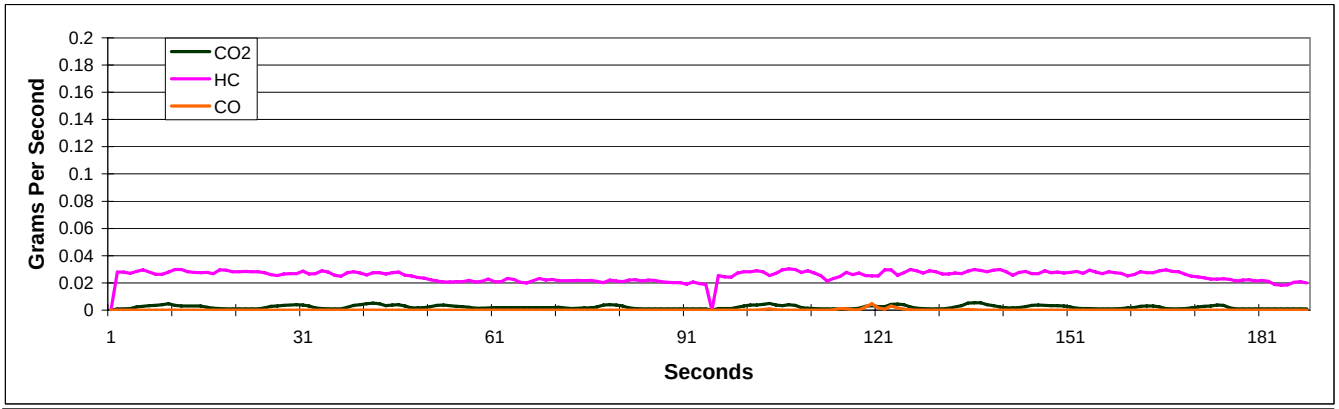


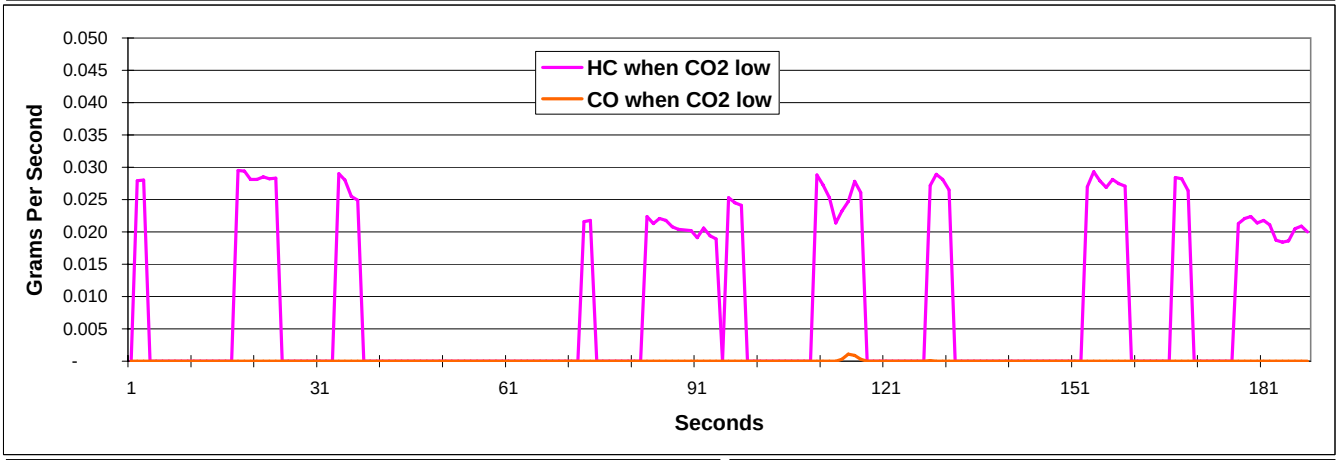


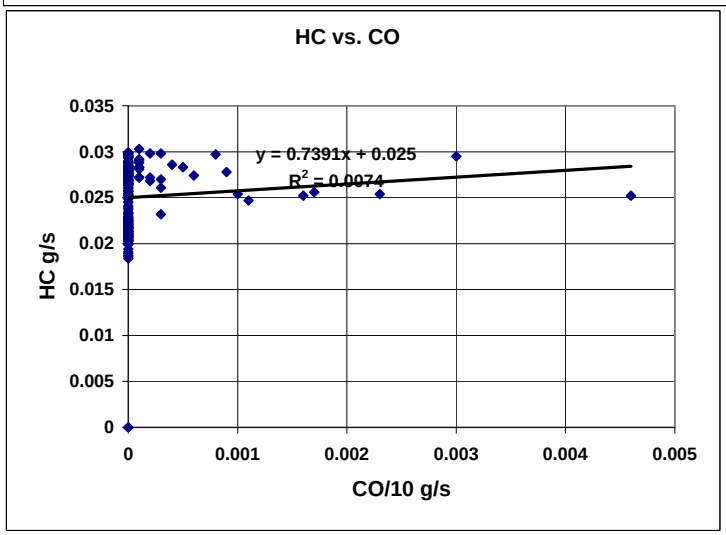


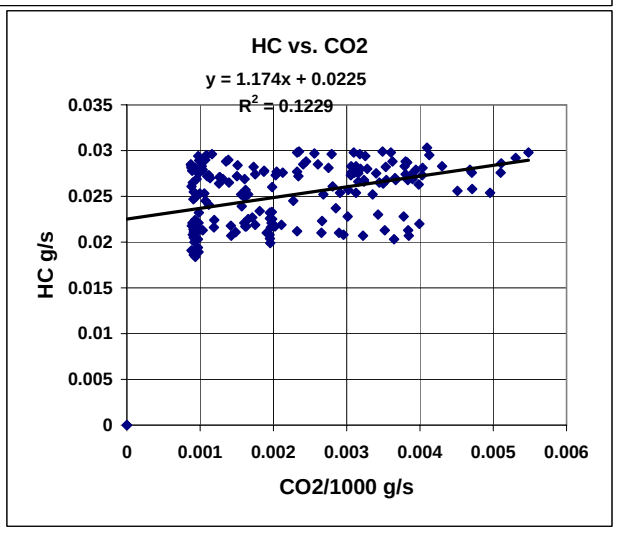
Ref: 213				**Leak predicted:** Yes	
Cert: 3007234	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	4.23
	HCLP: Plan B			**CO g/mi:**	0.19
	Note: propane on - engine idling between traces - 2nd hose racked				

Avg HC when CO2 low g/s:		**0.024**	**Stdev %:**	**19%**	**Avg HC-$HC_{CO:}$**	**0.025**	
HC vs. CO:	**A:**	**0.74**	**B:**	**0.025**	**R^2:**	**0.01**	**Stdev HC-$HC_{CO:}$** **0.004**
HC vs. CO2	**A:**	**1.17**	**B:**	**0.023**	**R^2:**	**0.12**	**Stdev HC-$HC_{CO2:}$** **0.004**





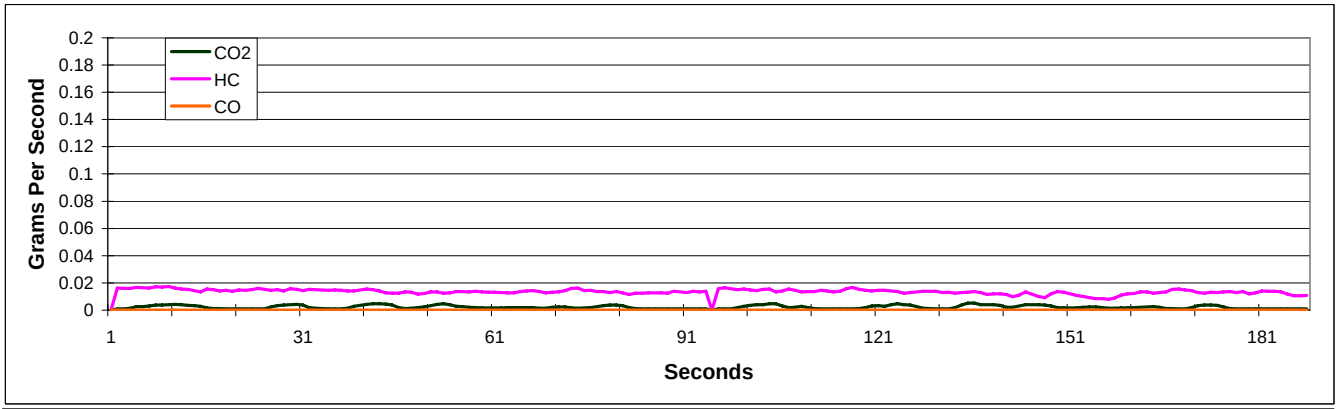


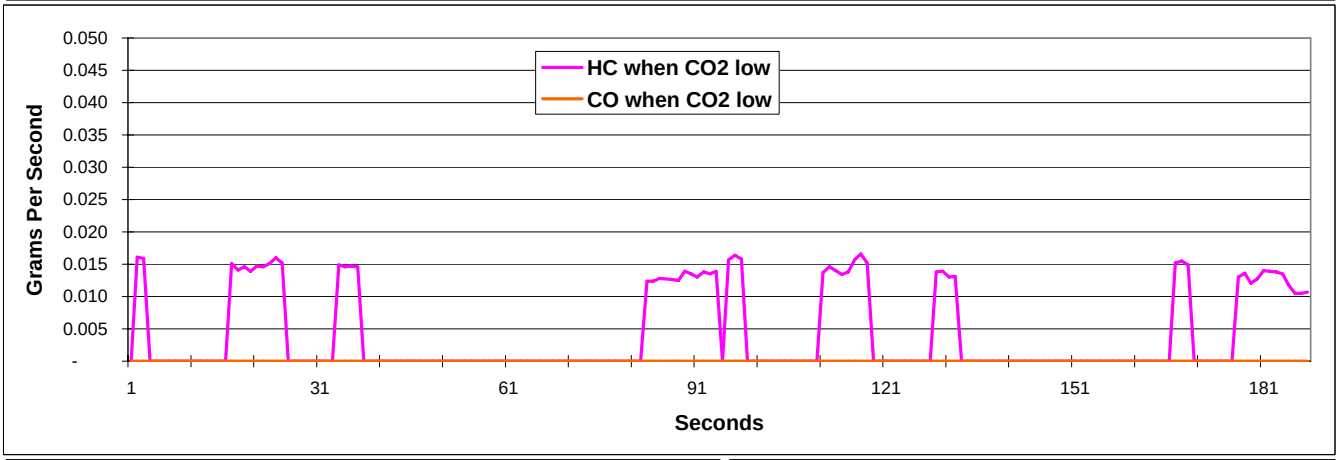


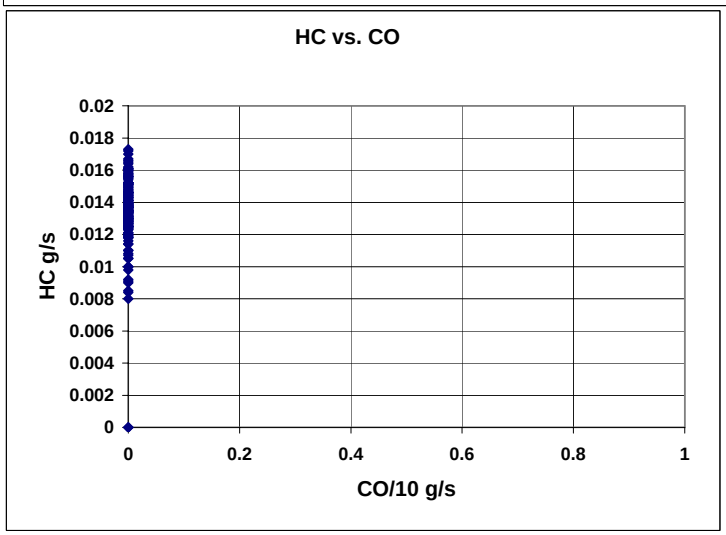
Ref: 214				**Leak predicted:** Yes	
Cert: 3007235	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	2.27
	HCLP: Plan B			**CO g/mi:**	-

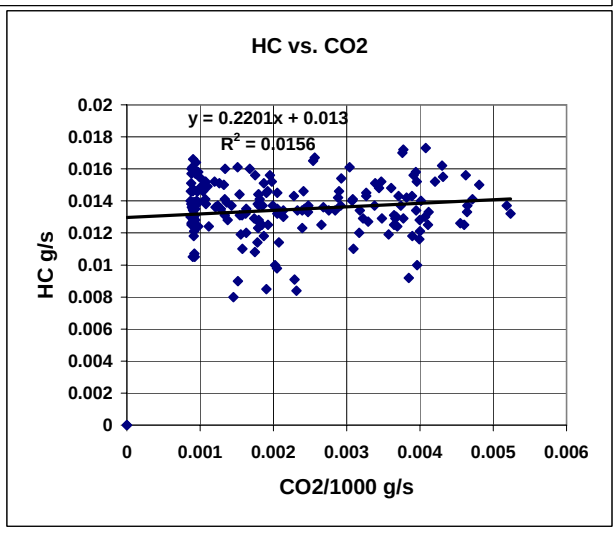
Note: propane on - engine off between traces - 2nd hose racked

Avg HC when CO2 low g/s:	0.014	**Stdev %:**	17%	**Avg HC-HC$_{CO_2}$:**	#DIV/0!				
HC vs. CO:	**A:** #DIV/0!		**B:**	#DIV/0!	**R^2:**	#DIV/0!	**Stdev HC-HC$_{CO_2}$:**	#DIV/0!	
HC vs. CO2	**A:**	0.22	**B:**	0.013	**R^2:**	0.02	**Stdev HC-HC$_{CO_2}$:**	0.002	



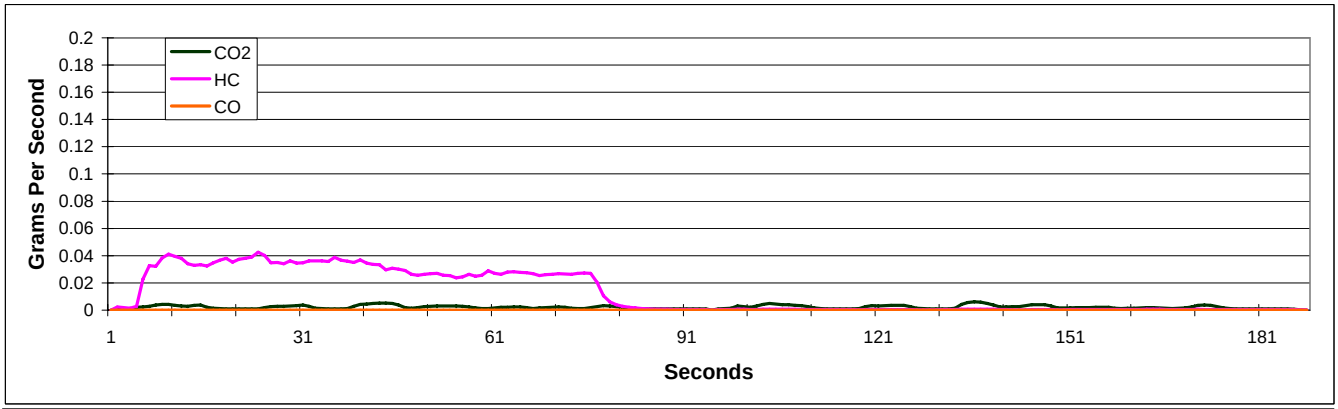


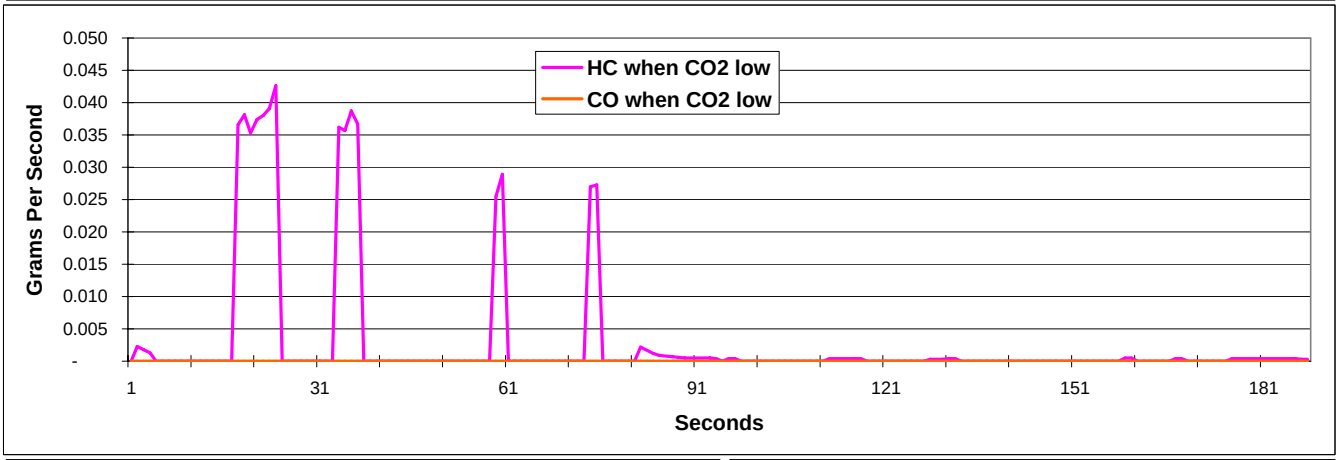


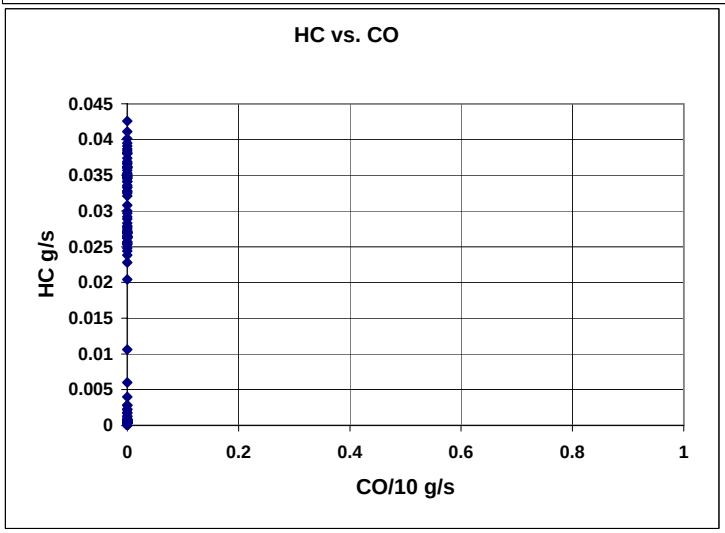


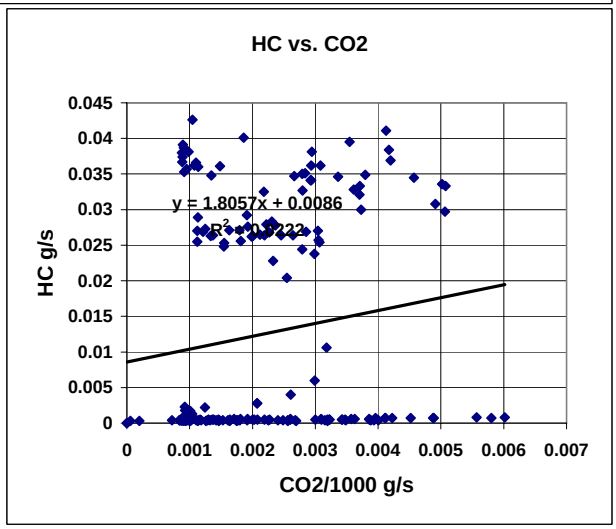
Ref: 215				**Leak predicted:** Yes	
Cert: 3007237	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	2.11
	HCLP: Plan B			**CO g/mi:**	-
	Note: no propane - kill engine at end of 2nd trace - trial 1				

Avg HC when CO2 low g/s:	0.009	**Stdev %:**	165%	**Avg HC-$HC_{CO:}$**	#DIV/0!		
HC vs. CO:	**A:** #DIV/0!		**B:** #DIV/0!	**R^2:**	#DIV/0!	**Stdev HC-$HC_{CO:}$**	#DIV/0!
HC vs. CO2	**A:** 1.81		**B:** 0.009	**R^2:**	0.02	**Stdev HC-$HC_{CO2:}$**	0.015



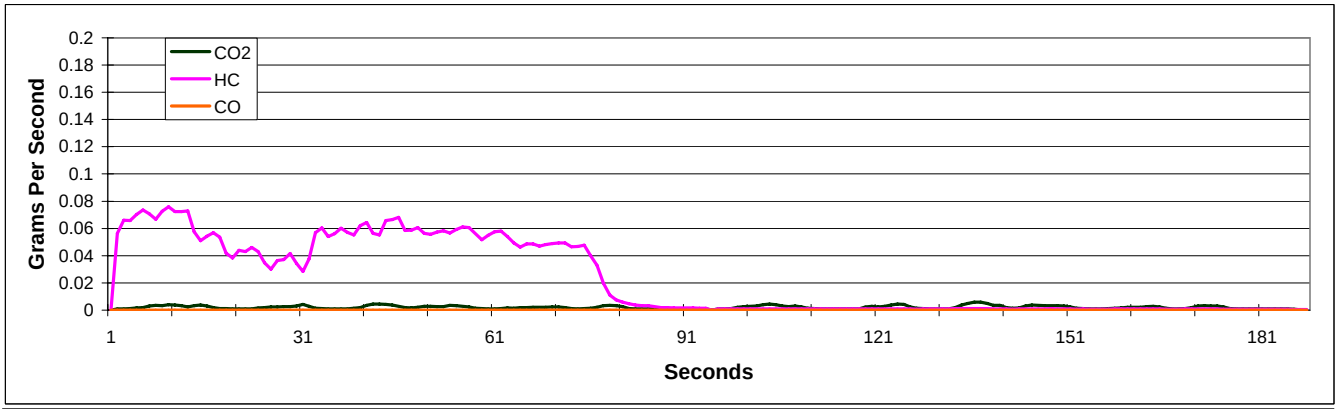


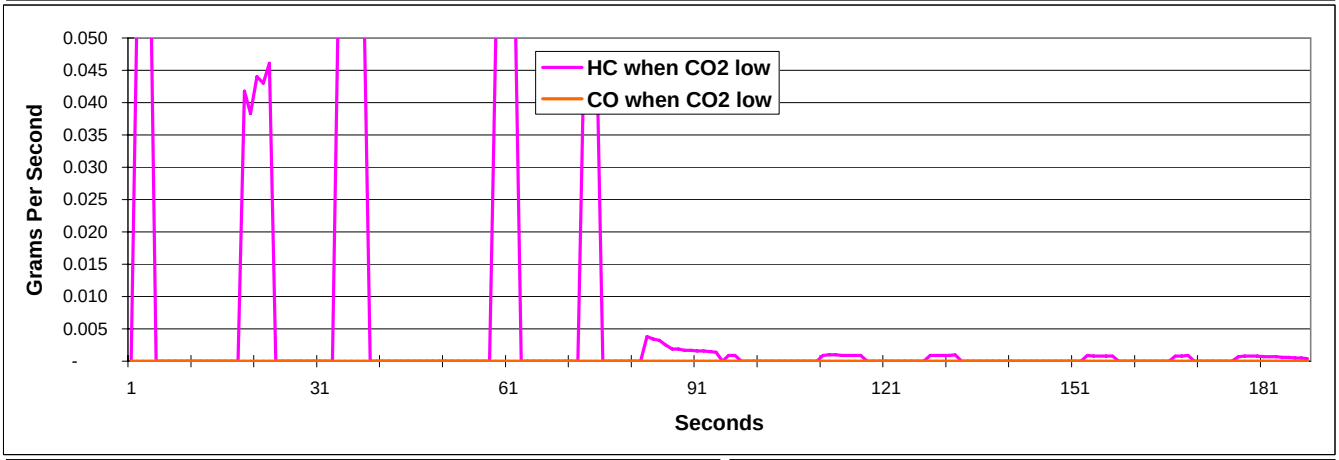


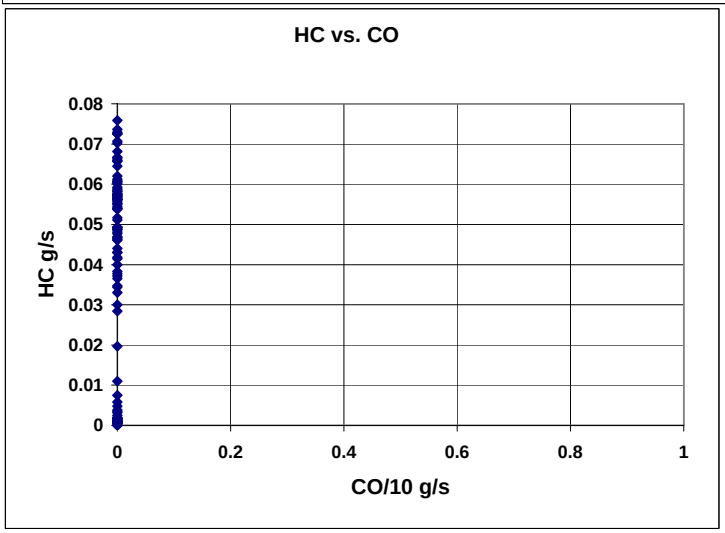


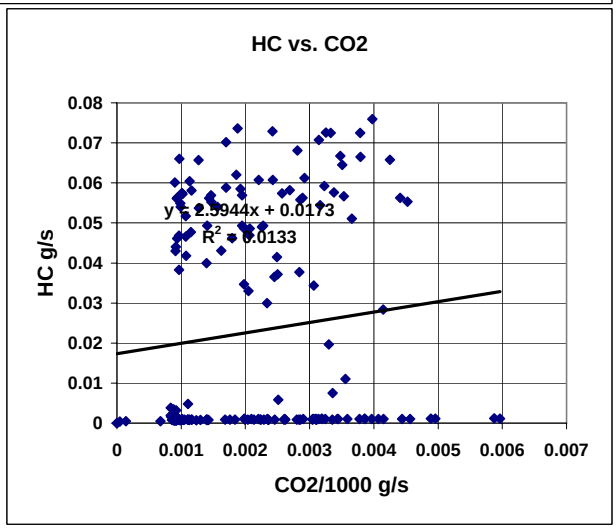
Ref: 216				**Leak predicted:** Yes	
Cert: 3007238	**VIN:** 1G1ND52M2W6181298		**Make:** CHEV		
Year: 1995	**Model:** MALIBU			**HC g/mi:**	3.87
	HCLP: Plan B			**CO g/mi:**	-
	Note: no propane - kill engine at end of 2nd trace - trial 2				

Avg HC when CO2 low g/s:	0.014	**Stdev %:**	156%	**Avg HC-HC_{CO_2}:**	#DIV/0!		
HC vs. CO:	**A:** #DIV/0!		**B:** #DIV/0!	**R^2:**	#DIV/0!	**Stdev HC-HC_{CO_2}:**	#DIV/0!
HC vs. CO2	**A:** 2.59		**B:** 0.017	**R^2:**	0.01	**Stdev HC-HC_{CO_2}:**	0.027









Appendix C – Leak Inspection Results

Leak Inspection Results

IM93 Second-by-second prediction

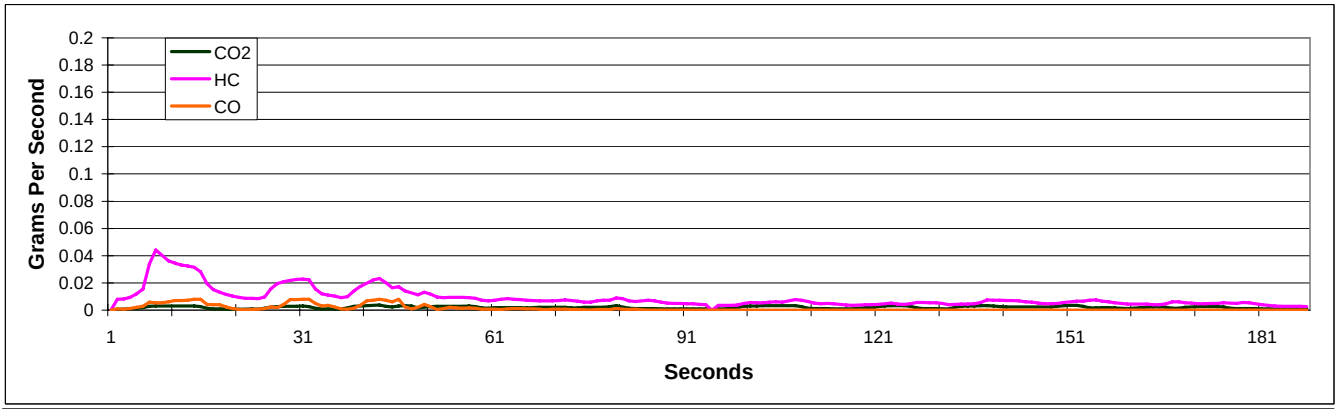
Ref Number	Date	VIN 4	Year	Make	Model	VIR	Leak or Vapor	Under Body or Under Hood	Comment	Bach lts	RAE ppm	Sec-By Sec	Ref	Correct Pass Pred	Correct Fail Pred	Missed Fail	False Fail
1	7/24/2007	5835	1991	Ford	Probe	3025912	Yes	Y	leak at fuel rail dampner	10		Yes	1			1	
2	7/26/2007	5890	1988	Ford	Escort	3026386	Yes	Y	leak at tank seam & misfire (vin on test set to 5600)	4		Yes	2		1		
3	8/8/2007	5596	1993	Saturn	SC	3028818	No					Yes	3	1			
4	8/8/2007	7117	1993	Buick	Regal	3028810	Yes	Y	leak at canister hoses RR fender			Yes	4			1	
5	8/13/2007	4893	1995	Pontiac	Firebird	2911477	Yes	Y	from repair advisor diagnosis			Yes	5		1		
6	8/13/2007	0176	1991	Chevy	Corvette	2938521	Yes	Y	from repair advisor diagnosis			Yes	6		1		
7	8/13/2007	9942	1991	Chevy	Camaro	2991705	Yes	Y	from repair advisor diagnosis			Yes	7		1		
8	8/13/2007	9231	1991	Pontiac	Firebird	2975555	Yes	Y	from repair advisor diagnosis			Yes	8		1		
9	8/13/2007	8695	1991	Chevy	Camaro	3025656	Yes	Y	from repair advisor diagnosis			Yes	9		1		
10	8/14/2007	2826	1989	Chevy	Cavalier	3026827	Yes	Y	response under middle of car - difficult to find. After RA run, wet gas line leak at frame rail near driver door		30	Yes	10		1		
11	8/14/2007	0240	1993	Dodge	Intrepid	3008952	No					Yes	11	1			
12	8/14/2007	8976	1993	Chrysler	LeBaron	3033634	No					Yes	12	1			
13	8/14/2007	4649	1991	Buick	LeSabre	3007174	No					Yes	13	1			
14	8/14/2007	2504	1987	Olds	Cutlass	3027683	Yes	Y	slight response at carb and canister - (early 70s open loop carb'd Pontiac engine)			Yes	14		1		
15	8/14/2007	7938	1995	Olds	Cutlass	3028993	Yes	Y	response at canister hoses LR fender	1	200	Yes	15			1	
16	8/14/2007	3009	1993	Chevy	Astro	3028999	No					Yes	16	1			
17	8/14/2007	8294	1992	GMC	Yukon	3027706	Yes	Y	slight odor at rear - no response. Slight response near TBI - air cleaner mia			No	17				
18	8/14/2007	0429	1989	Mazda	MX6	2983144	No					Yes	18	1			
19	8/14/2007	7441	1995	Ford	F150	3029018	No					Yes	19				1
20	8/14/2007	7488	1992	Buick	Roadmaster	2916416	No					Yes	20	1			
21	8/14/2007	4208	1983	Lincoln	Town Car	3029021	Yes	G	significant leak at gas cap - very high pressure on removal. Cracks at edge of gasket - cap seals near edge on vehicle. Cap passed ck probably because adapter seals further in on cap gasket.	4	400	Yes	21			1	
22	8/14/2007	3895	1991	Chevy	C1500	2991708	Yes	Y	small leak at canister - LF undhd - clamp removed from line	1	9	No	22				
23	8/14/2007	8792	1993	Dodge	Stealth	3029027	Yes	Y	small response at gas cap and RR fender. Small response at intake by injectors.	1		Yes	23			1	
24	8/16/2007	7402	1993	Geo	Prism	3027271	Yes	G	small response at gas cap		20	No	24				
25	8/16/2007	1305	1992	Cadilac	Eldo	2908430	No					Yes	25	1			
26	8/16/2007	2679	1993		Aclaim	3033691	Yes	G	small response at gas cap		8	Yes	26		1		
27	8/16/2007	4067	1992	Chevy	Malibu	2922333	No					Yes	27				1
28	8/17/2007	2205	1995	Dodge	Intrepid	2620603	Yes	Y	small response at RS intake manifold - no odor	1		Yes	28			1	
29	8/21/2007	4595	1993	Ford	Escort	2939255	Yes	F	response at tank fill - behind neck trim		28-54	Yes	29			1	
30	8/21/2007	4972	1985	Buick	LeSabre	3003907	Yes	Y	response at air cleaner		8-15	No	30				
31	8/21/2007	6624	1991	Honda	Civic	2911453	No					Yes	31	1			

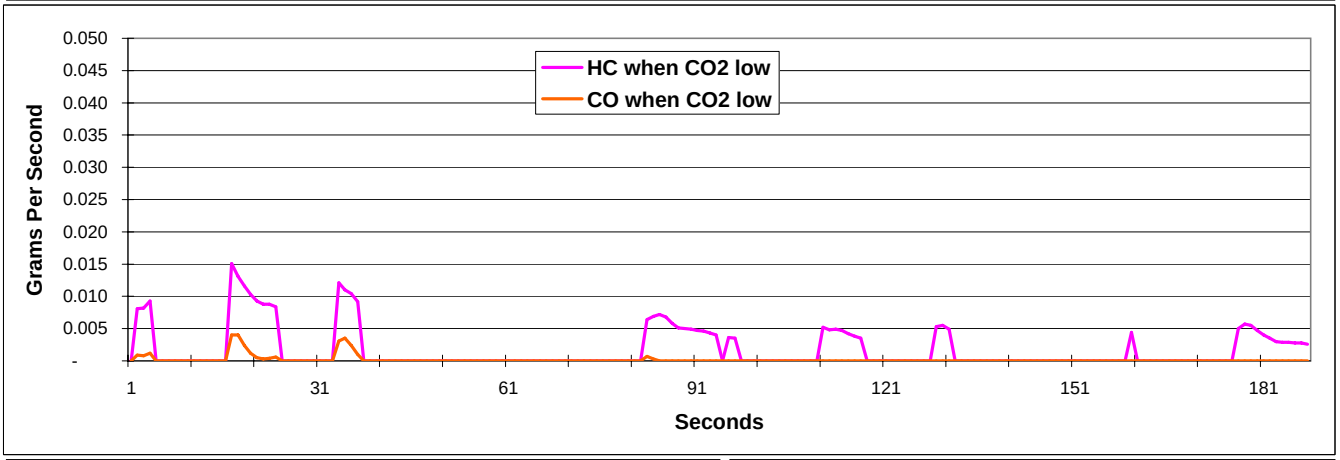
Ref Number	Date	VIN 4	Year	Make	Model	VIR	Leak or Vapor	Under Body or Under Hood	Comment	Bach lts	RAE ppm	Sec-By Sec	Ref	Correct Pass Pred	Correct Fail Pred	Missed Fail	False Fail
32	8/21/2007	9722	1995	Ford	Probe	2906692	No					Yes	32				1
33	8/21/2007	4934	1987	Cadillac	Brougham	2917502	No					Yes	33	1			
34	8/21/2007	9904	1991	Olds	Cutlass	2910672	No					Yes	34	1			
35	8/21/2007	6898	1994	Nissan	Altima	3028047	Yes	G	gas cap neck		20-40	Yes	35			1	
36	8/21/2007	3097	1989	Honda	Accord	3002964	Yes	F	tank fill tube to hose - wet		40-85	Yes	36		1		
37	8/21/2007	4626	1993	Chevy	Camaro	2916569	Yes	F	fuel fill neck / LS tank		20-60	Yes	37		1		
38	8/21/2007	4779	1987	Cadillac	DeVille	3026785	Yes	G	gas cap (20-150) wrong cap? Replaced w/10817. at air cleaner (10-20)		20-150	Yes	38			1	
39	8/21/2007	9491	1991	Ford	Mustang	3003593	Yes	Y	tank line at canister disconnected. Reconnected = pass		500+	Yes	39		1		
40	8/22/2007	8042	1991	Honda	Accord	3035080	No					Yes	40	1			
41	8/22/2007	2406	1993	Chevy	Cavalier	3035097	Yes	Y	R center - fuel filter area		10-50	Yes	41			1	
42	8/22/2007	4084	1995	Chevy	van	3028146	No					Yes	42				1
43	8/22/2007	9762	1987	Chevy	Impala	3028155	Yes	Y	air cleaner		10	No	43				
44	8/23/2007	4009	1993	Chrysler	Concorde	3015053	Yes	Y	left bank - cyl 4,6 at injector rail	4	1500+	Yes	44		1		
45	8/23/2007	7821	1993	Chevy	Cavalier	2617149	No					Yes	45	1			
46	8/23/2007	5700	1994	Chevy	van	2911280	Yes	Y	air cleaner snorkel		80-170	No	46				
47	8/28/2007	6543	1995	Chevy	Blazer	2916747	No					Yes	47				1
48	8/28/2007	5701	1991	Buick	Park Ave	2922800	No					Yes	48				1
49	8/28/2007	7195	1994	Toyota	4RNR	2916755	No					Yes	49				1
50	8/28/2007	0051	1991	Chevy	Camaro	3029127	Yes	Y	LS tank / air cleaner	2	50-90	Yes	50			1	
51	8/28/2007	6903	1987	Toyota	Camry	3028767	No					Yes	51	1			
52	8/30/2007	8822	1991	Chevy	Caprice	3029433	No					Yes	52	1			
53	8/30/2007	9821	1991	Olds	Cutlass	3035661	No					Yes	53	1			
54	8/31/2007	8225	1995	Chevy	Corvette	3035763	Yes	Y	gas tank	1	40-125	No	54				
55	8/31/2007	3473	1987	Cadillac	Brougham	3035765	Yes	Y	air cleaner / canister	1		No	55				
56	8/31/2007	3001	1995	Chevy	Tahoe	3029517	Yes	Y	canister		40-238	No	56				
57	8/31/2007	8481	1985	MB	500SEL	3035783	Yes	Y	gas cap / under hood response near grille - couldn't zero in. when car left, found 3" dia. spot behind where LF tire was - probably fuel line leak.	1/1	6-9	No	57				
58	9/4/2007	6229	1987	Nissan	Maxima	3029640	No					Yes	58				1
59	9/4/2007	0345	1989	Pontiac	Sunbird	3031654	Yes	F	response at filler neck	1		Yes	59			1	
60	9/4/2007	1284	1993	Chevy	van	3029654	No					Yes	60				1
61	9/5/2007	3064	1993	Lincoln	TC	3031682	No					Yes	61	1			
62	9/5/2007	3028	1993	Mercury	Villager	3031685	Yes	Y	LS of fuel tank	10	163	Yes	62		1		
63	9/5/2007	4216	1995	Chevy	Cavalier	3029680	Yes	Y	tank filler neck / at throttle body area	1/1	6-10	Yes	63			1	
64	9/5/2007	4928	1995	Mercury	Cougar	3030017	No					Yes	64	1			
65	9/5/2007	6774	1993	Ford	Tempo	3029685	Yes	Y	at tank fill / top of tank	2/3	17	Yes	65		1		
66	9/5/2007	4282	1993	Olds	Cutlass	2922718	No					Yes	66				1
67	9/6/2007	1662	1993	Plymouth	Duster	2910506	No					Yes	67	1			
68	9/6/2007	8317	1983	Chevy	van	3030131	No					Yes	68				1
69	9/6/2007	4948	1985	Ford	F150	3030132	Yes	F	filler neck	1		Yes	69		1		

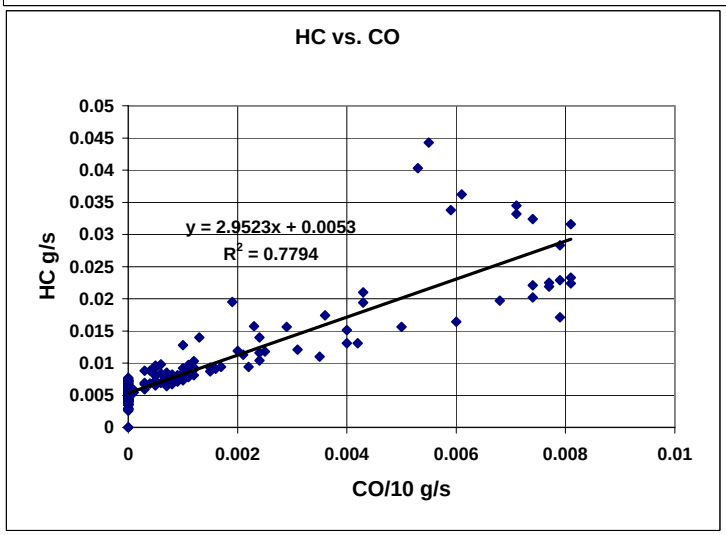
Ref Number	Date	VIN 4	Year	Make	Model	VIR	Leak or Vapor	Under Body or Under Hood	Comment	Bach lts	RAE ppm	Sec-By Sec	Ref	Correct Pass Pred	Correct Fail Pred	Missed Fail	False Fail
70	9/6/2007	9275	1995	Mitsu	Esclipse	3030134	Yes	Y	top of fuel tank RR	10		Yes	70			1	
71	9/6/2007	2679	1993	Plymouth	Aclaim	3033691	Yes	Y	fuel sender on tank wet (same VIR as 26)		133	Yes	71		1		
72	9/10/2007	6784	1995	Pontiac	Firebird	2922592	Yes	Y	fuel tank top	2		Yes	72			1	
73	9/10/2007	8493	1995	Chevy	Camaro	3035887	Yes	Y	fuel tank top	3	105	Yes	73		1		
74	9/10/2007	4479	1995	Chevy	Cavalier	2906999	No					Yes	74	1			
75	9/11/2007	6810	1991	Chevy	Caprice	3030420	No					Yes	75	1			
76	9/11/2007	2279	1993	Cadillac	DeVille	3035935	No					Yes	76	1			
77	9/11/2007	5247	1986	Olds	Cutlass	3035945	No					Yes	77				1
78	9/11/2007	1824	1991	Pontiac	Transport	3030456	No					Yes	78				1
79	9/11/2007	6866	1987	Chevy	Corvette	3030491	Yes	Y	fuel tank top / injector rail both sides	1 / 1		Yes	79		1		
80	9/11/2007	4021	1991	Chevy	1500	3017531	Yes	Y	fuel tank top		22-30	Yes	80			1	
81	9/11/2007	4008	1991	Dodge	Daytona	2922930	No					Yes	81	1			
82	9/11/2007	5708	1995	Buick	Century	3017394	No					Yes	82				1
83	9/11/2007	1585	1989	Chevy	Beretta	3017561	Yes	Y	R/S engine near steering pump		30-40	Yes	83			1	
84	9/11/2007	3133	1993	Saturn	SL	3017575	No					Yes	84	1			
85	9/11/2007	9778	1993	Lincoln	TC	2956435	No					Yes	85	1			
86	9/11/2007	5482	1993	Dodge	Intrepid	3035804	No					Yes	86	1			
87	9/11/2007	9020	1987	Olds	Firenza	3017593	Yes	F	filler neck		8-9	Yes	87		1		
88	9/11/2007	5966	1995	Chevy	Blazer	3016273	No					Yes	88				1
89	9/11/2007	1442	1989	Pontiac	Firebird	3016277	Yes	Y	filler neck / fuel tank top		355	Yes	89		1		
90	9/12/2007	7984	1993	Nissan	Altima	3030557	No					Yes	90	1			
91	9/12/2007	1063	1995	Ford	Escort	3030568	Yes	Y	fuel tank top	1		Yes	91			1	
92	9/12/2007	3327	1993	Mercury		3030569	No		(oil burner)			Yes	92	1			
93	9/12/2007	5155	1993	Chevy	Cavalier	3030574	Yes	Y	filler neck / fuel tank top	1 / 1		Yes	93			1	
94	9/12/2007	4501	1989	Lincoln	Continental	3030582	Yes	G	filler neck / fuel tank top - tighten cap - gone	1 / 1		Yes	94		1		
95	9/12/2007	9477	1993	Chevy	Cavalier	3030586	Yes	Y	canister	1		Yes	95			1	
96	9/12/2007	6023	1991	Honda	Accord	3031922	No					Yes	96	1			
97	9/12/2007	1336	1993	Lincoln	TC	3030590	No					Yes	97	1			
98	9/14/2007	7514	1995	Ford	PU	3030793	No					Yes	98	1			
99	9/14/2007	9304	1985	Mercedes	280SE	3030798	No					Yes	99				1
100	9/17/2007	2406	1993	Chevy	Cavalier	3030447	Yes	Y	rusted tank		500	Yes	100			1	
Total														31	22	21	16

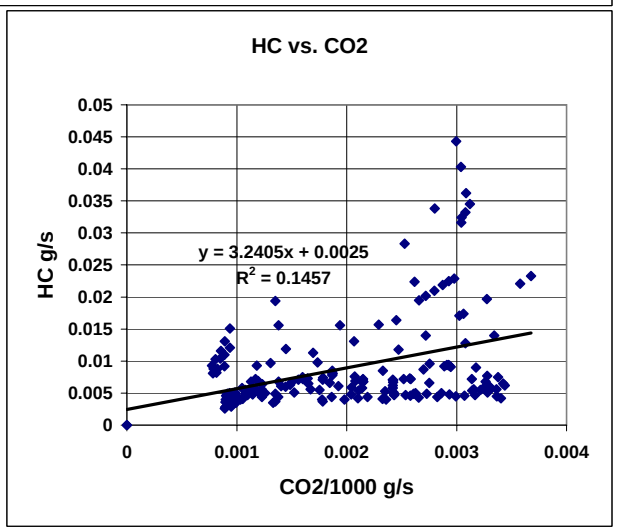
Ref: 1				**Leak predicted:**	No
Cert: 3025912	**VIN:** 1ZVPT20C2M5105835		**Make:** FORD		
Year: 1991	**Model:** PROBE			**HC g/mi:**	1.48
	HCLP: Yes			**CO g/mi:**	2.02
	Note: leak at fuel rail dampner				

Avg HC when CO2 low g/s:	0.006	**Stdev %:**	52%	**Avg HC-$HC_{CO:}$**	0.005		
HC vs. CO:	**A:** 2.95	**B:** 0.005		**R^2:**	0.78	**Stdev HC-$HC_{CO:}$**	0.004
HC vs. CO2	**A:** 3.24	**B:** 0.002		**R^2:**	0.15	**Stdev HC-$HC_{CO2:}$**	0.007



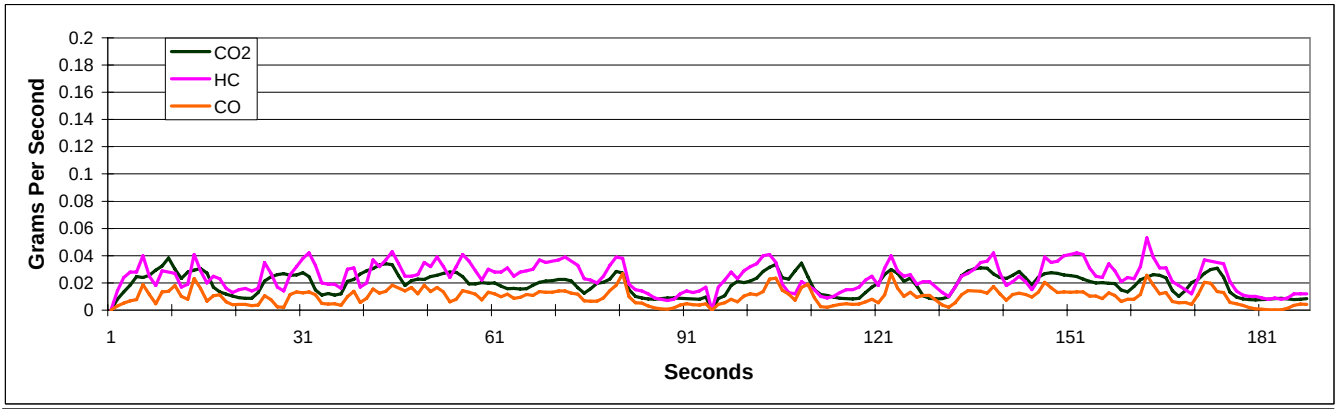


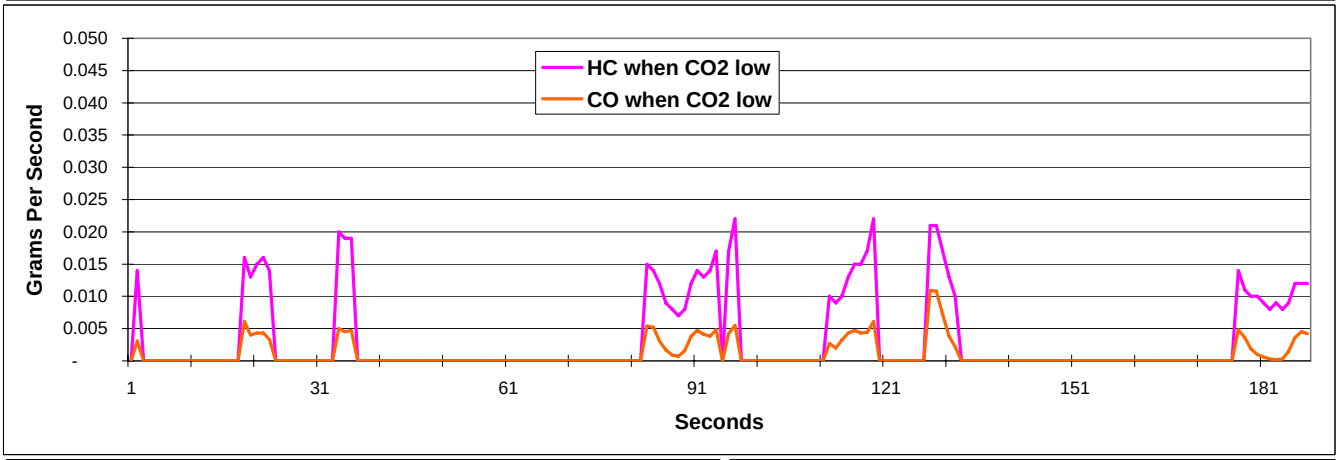


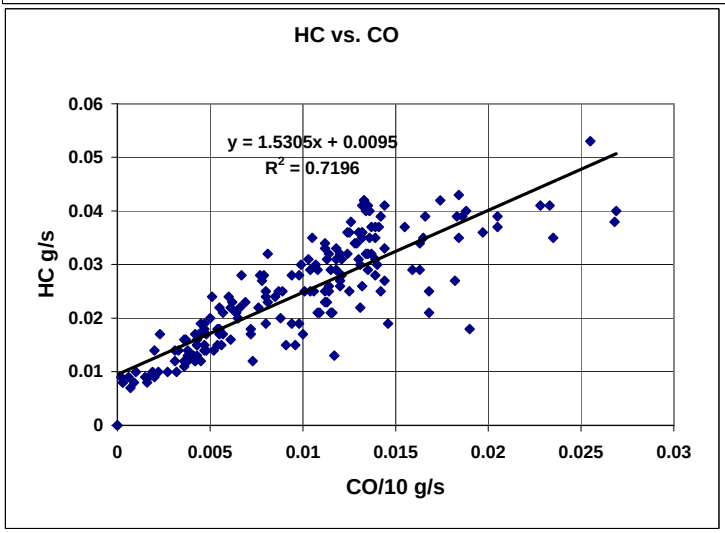


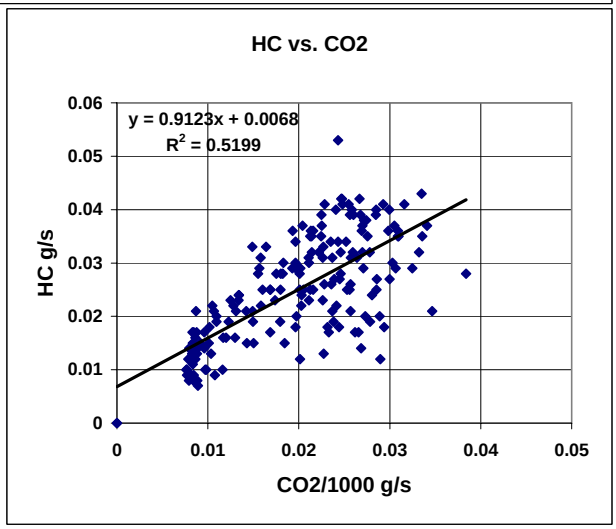
Ref: 2				**Leak predicted:**	Yes
Cert: 3026386	**VIN:** 12345678912345600		**Make:** FORD		
Year: 1988	**Model:** ESCORT			**HC g/mi:**	4.14
	HCLP: Yes			**CO g/mi:**	16.54
	Note: leak at tank seam & misfire				

Avg HC when CO2 low g/s:		0.013	**Stdev %:**	34%	**Avg HC-$HC_{CO:}$**	0.010	
HC vs. CO:	**A:**	1.53	**B:**	0.010	**R^2:**	0.72	**Stdev HC-$HC_{CO:}$** 0.005
HC vs. CO2	**A:**	0.91	**B:**	0.007	**R^2:**	0.52	**Stdev HC-$HC_{CO2:}$** 0.007



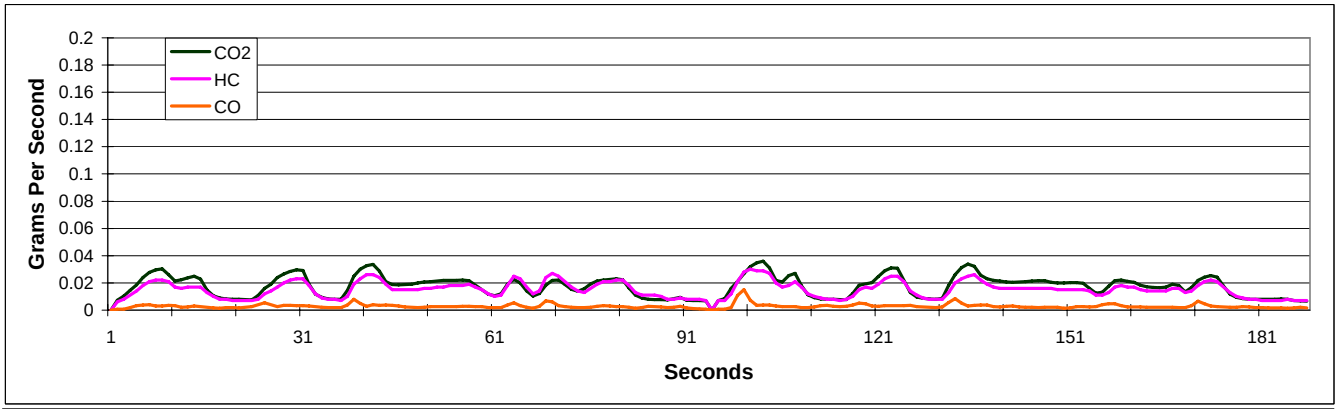


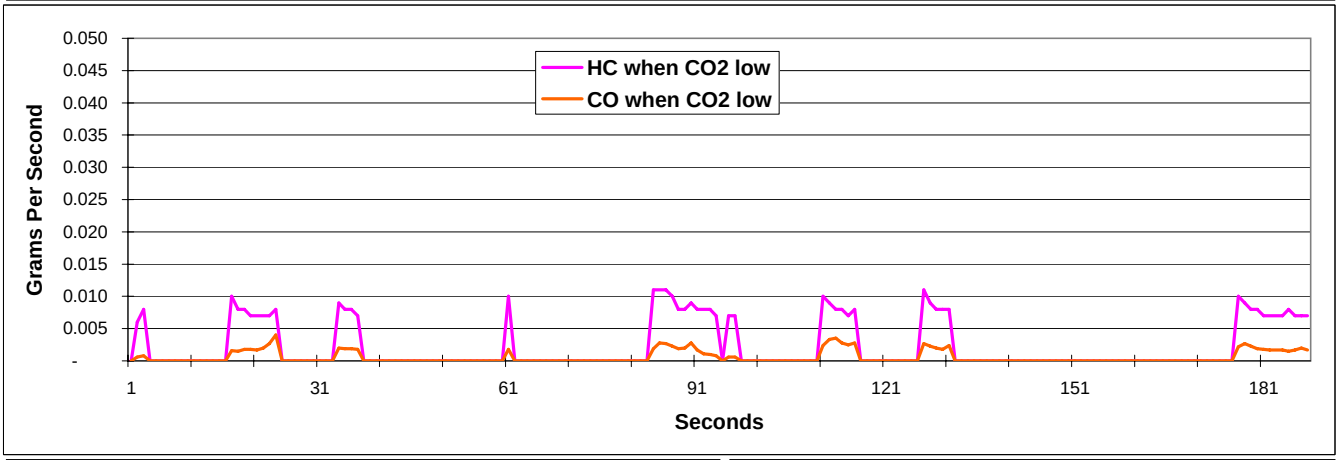


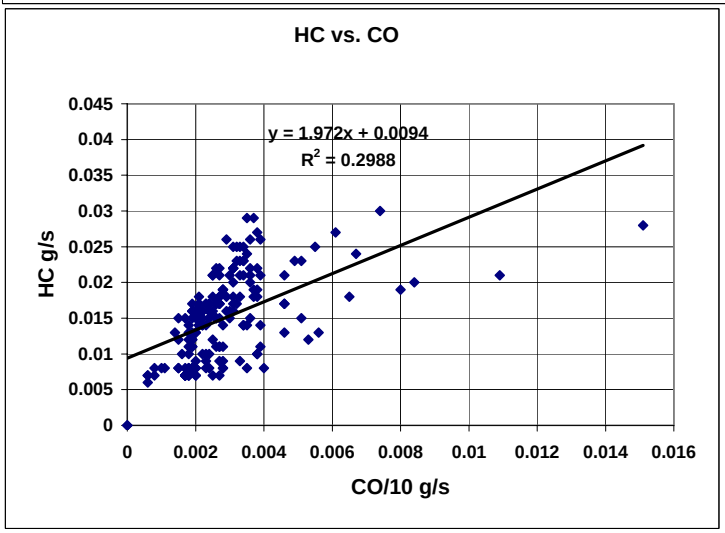


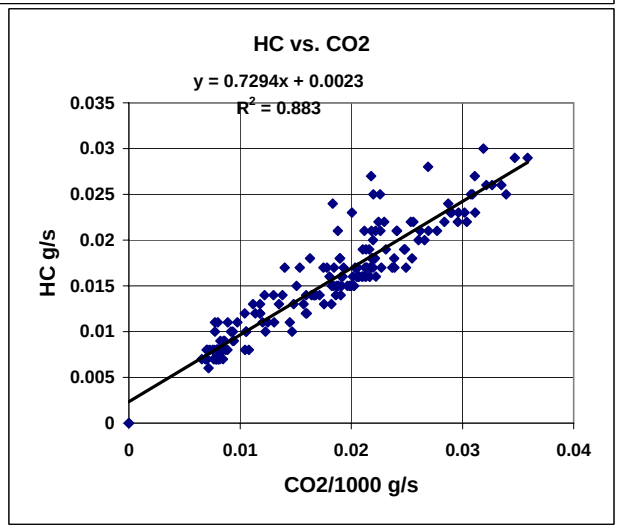
Ref: 3						**Leak predicted:**	No
Cert: 3028818	**VIN:** 1G8ZH1579PZ215596			**Make:** STRN			
Year: 1993	**Model:** SC				**HC g/mi:**	2.45	
	HCLP: No				**CO g/mi:**	4.68	
	Note: 0						

Avg HC when CO2 low g/s:		0.008	**Stdev %:**	21%	**Avg HC-$HC_{CO:}$**	0.009			
HC vs. CO:	**A:**	1.97	**B:**	0.009	**R^2:**	0.30	**Stdev HC-$HC_{CO:}$**	0.005
HC vs. CO2	**A:**	0.73	**B:**	0.002	**R^2:**	0.88	**Stdev HC-$HC_{CO2:}$**	0.002



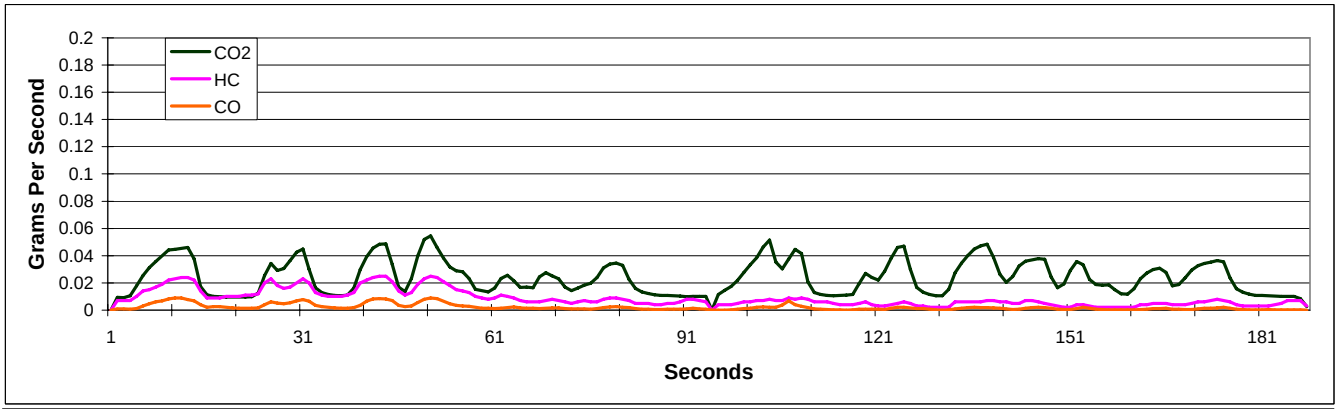


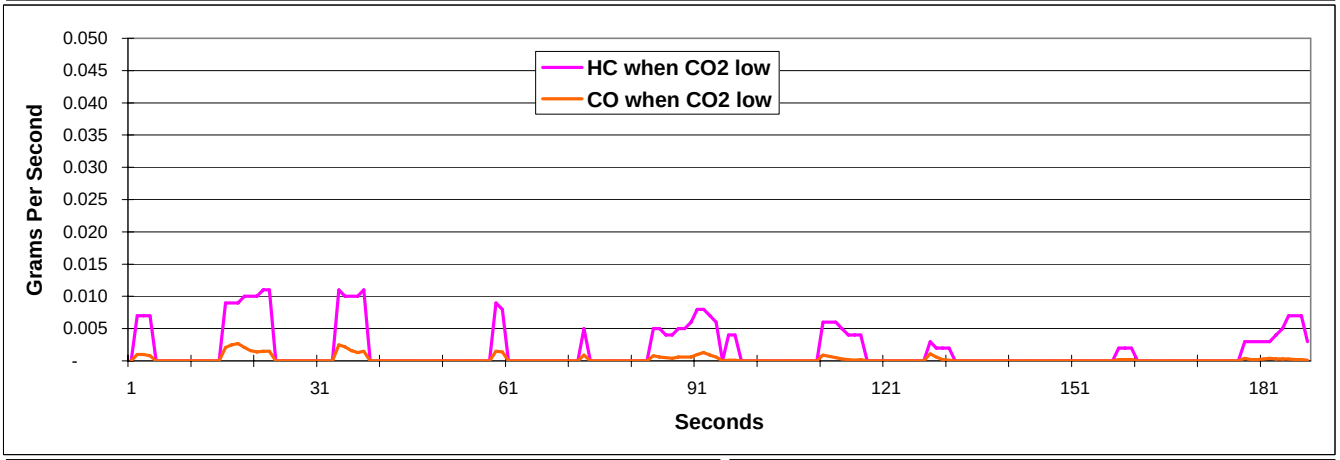


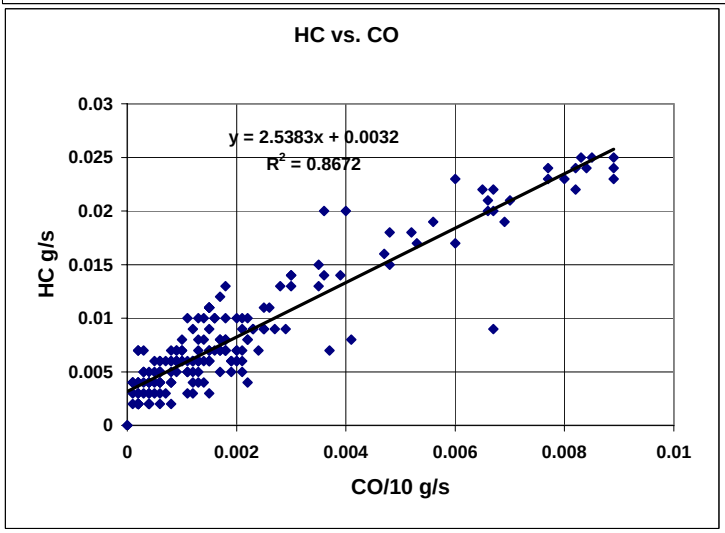


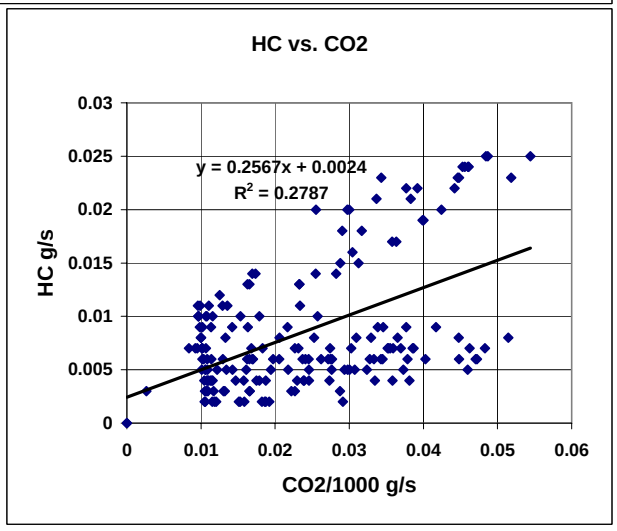
Ref: 4				**Leak predicted:**	No
Cert: 3028810	**VIN:** 2G4WB54L1P1437117		**Make:** BUIC		
Year: 1993	**Model:** REGAL			**HC g/mi:**	1.44
	HCLP: Yes			**CO g/mi:**	3.56
	Note: leak at canister hoses RR fender				

Avg HC when CO2 low g/s:	0.006	**Stdev %:**	51%	**Avg HC-$HC_{CO:}$**	0.003		
HC vs. CO:	**A:** 2.54	**B:** 0.003		**R^2:**	0.87	**Stdev HC-$HC_{CO:}$**	0.002
HC vs. CO2	**A:** 0.26	**B:** 0.002		**R^2:**	0.28	**Stdev HC-$HC_{CO2:}$**	0.005









Ref: 5 | Leak predicted: Yes

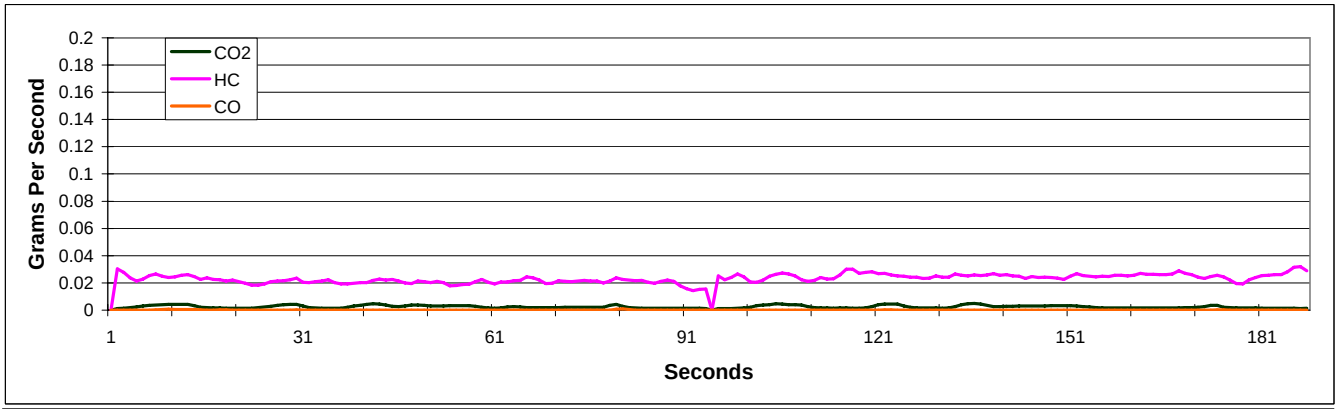
Cert: 2911477 | VIN: 2G2FV22P5S2214893 | Make: PONT

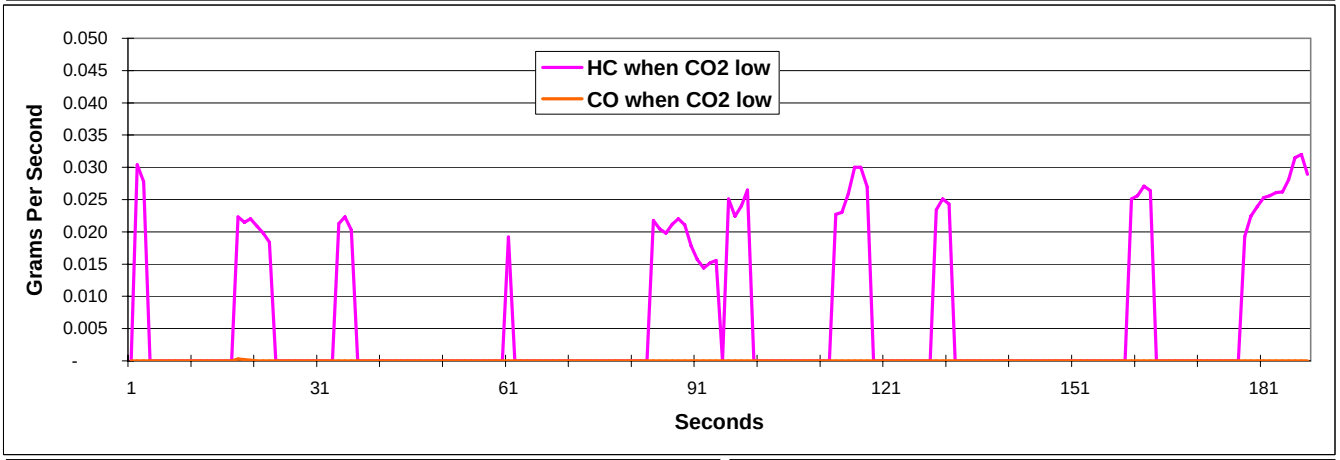
Year: 1995 | Model: FIREBI | HC g/mi: 3.83

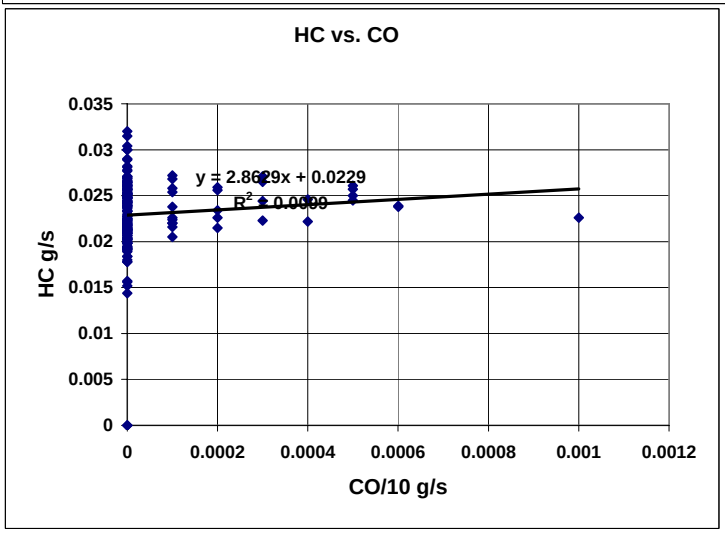
HCLP: Yes | CO g/mi: 0.07

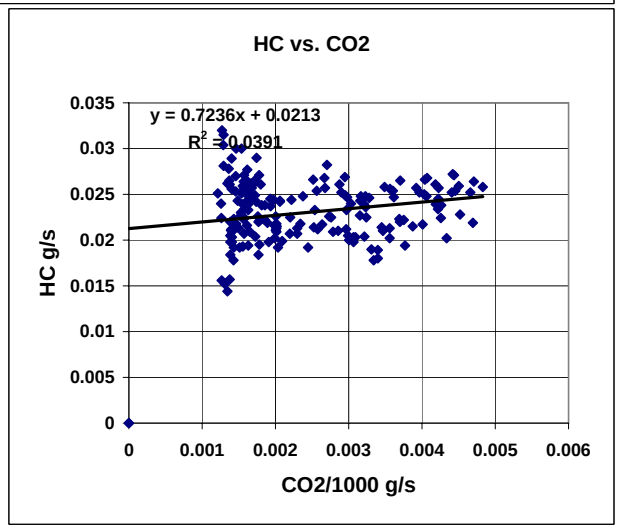
Note: from repair advisor diagnosis

Avg HC when CO2 low g/s:		0.023	Stdev %:	23%	Avg HC-$HC_{CO:}$	0.023		
HC vs. CO:	A:	2.86	B:	0.023	R^2:	0.01	Stdev HC-$HC_{CO:}$	0.004
HC vs. CO2	A:	0.72	B:	0.021	R^2:	0.04	Stdev HC-$HC_{CO2:}$	0.003



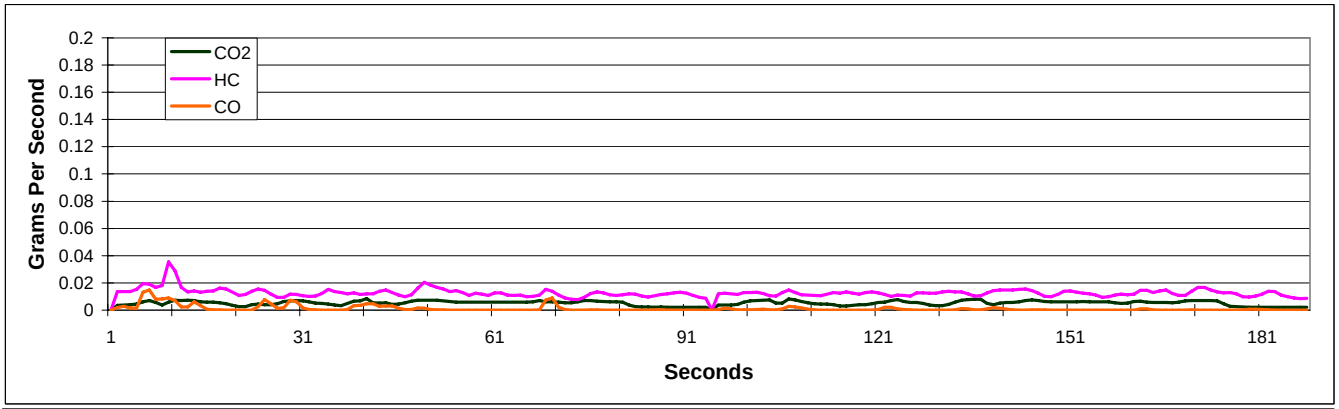


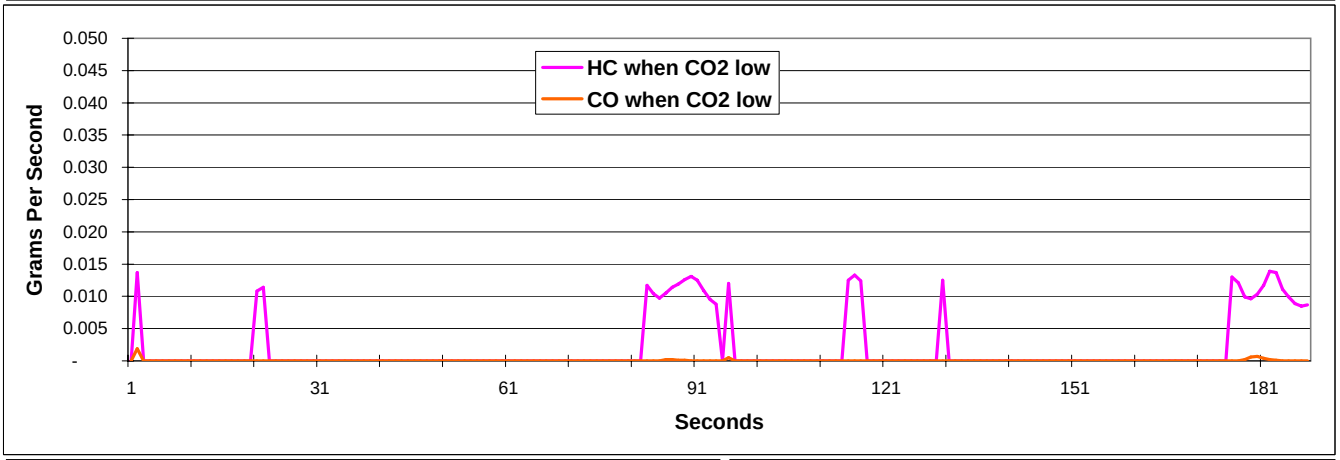


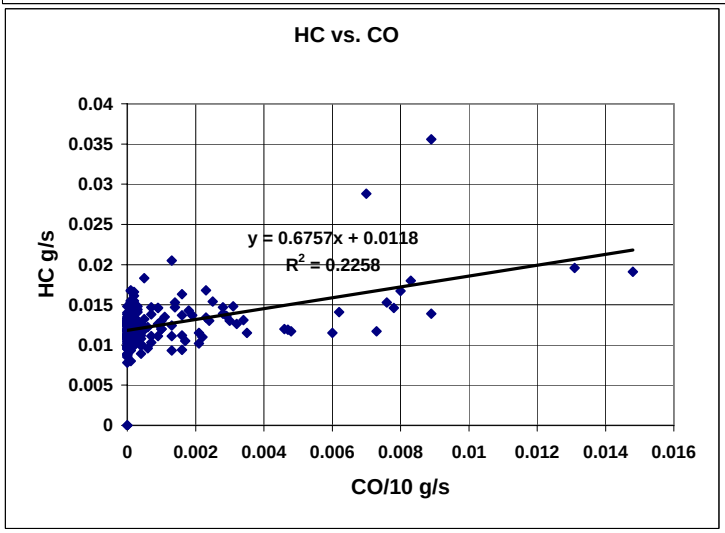


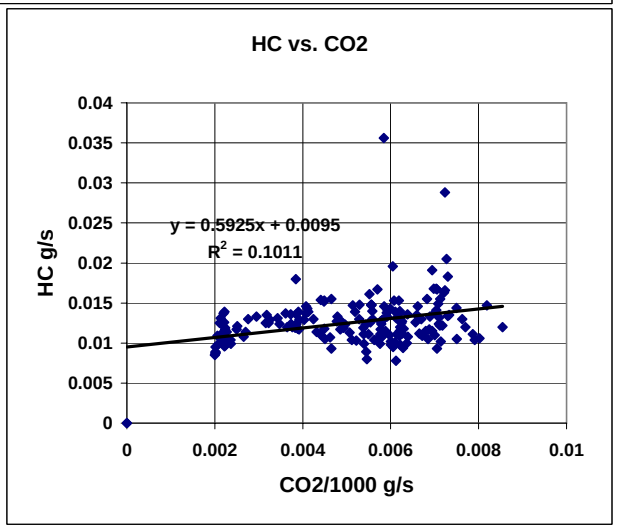
Ref: 6				**Leak predicted:**	Yes
Cert: 2938521	**VIN:** 1G1YY3384M5110176		**Make:** CHEV		
Year: 1991	**Model:** CORVET			**HC g/mi:**	2.13
	HCLP: Yes			**CO g/mi:**	1.85
	Note: from repair advisor diagnosis				

Avg HC when CO2 low g/s:		**0.011**	**Stdev %:**	**23%**	**Avg HC-$HC_{CO:}$**	**0.012**	
HC vs. CO:	**A:**	**0.68**	**B:**	**0.012**	**R^2:**	**0.23**	**Stdev HC-$HC_{CO:}$** **0.003**
HC vs. CO2	**A:**	**0.59**	**B:**	**0.010**	**R^2:**	**0.10**	**Stdev HC-$HC_{CO2:}$** **0.003**



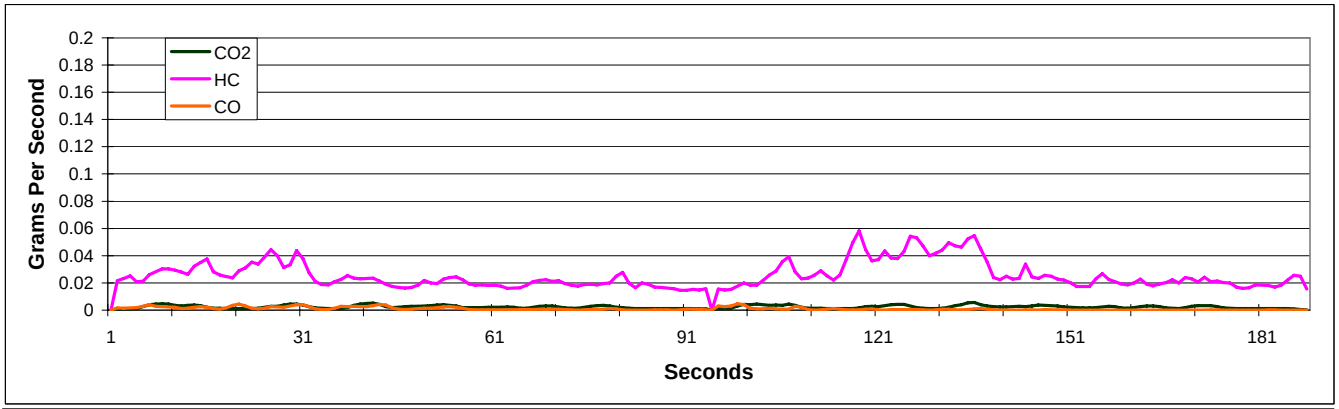


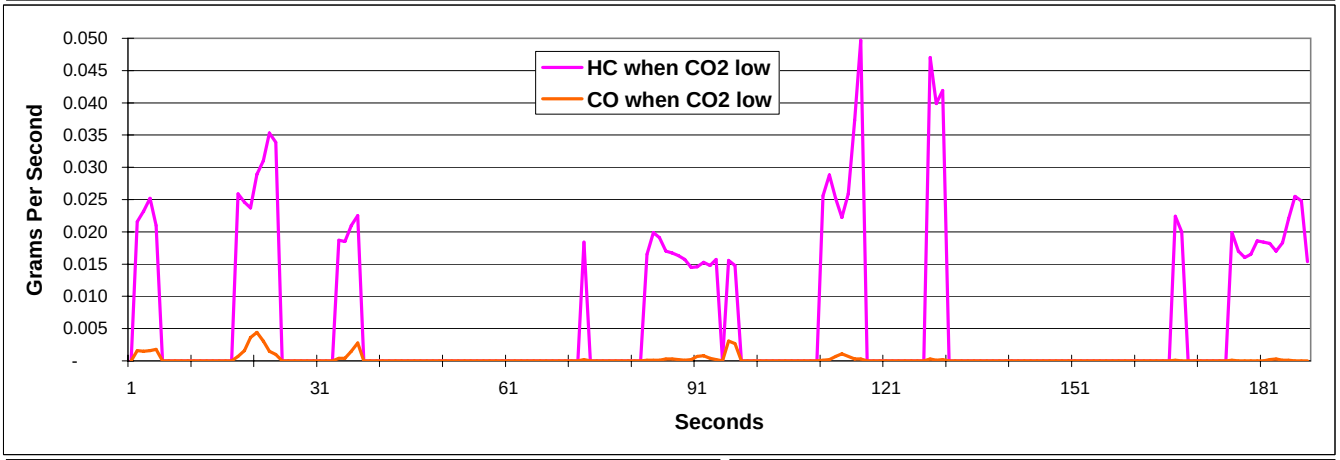


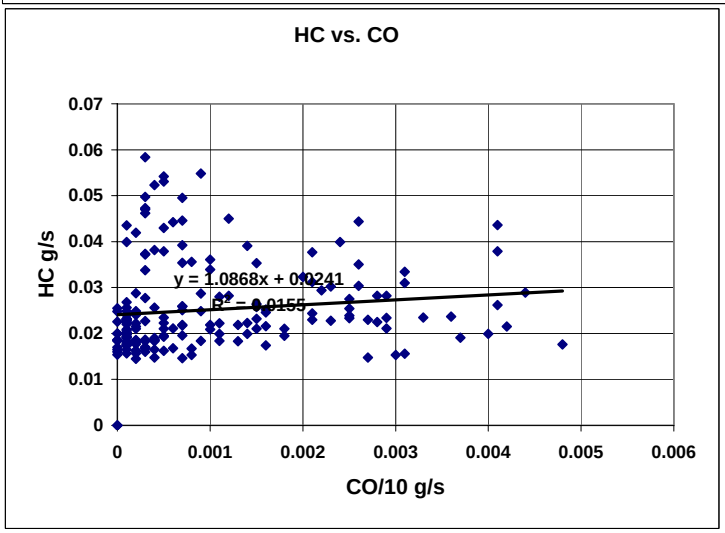


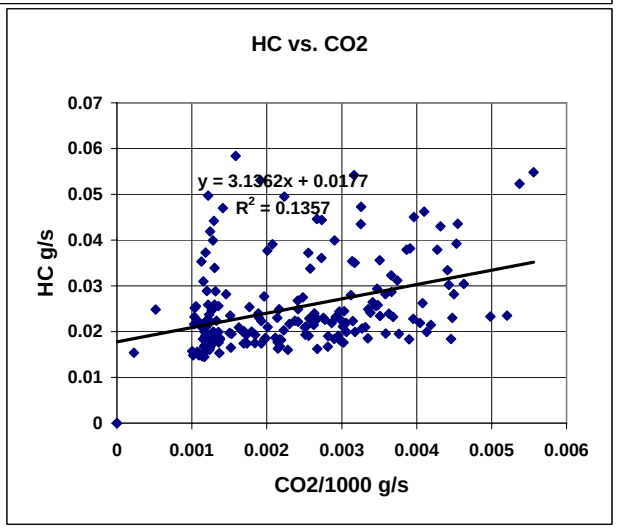
Ref: 7				Leak predicted:	Yes
Cert: 2991705	VIN: 1G1FP23E7ML129942		Make: CHEV		
Year: 1991	Model: CAMARO		HC g/mi:	4.18	
	HCLP: Yes		CO g/mi:	1.60	
	Note: from repair advisor diagnosis				

Avg HC when CO2 low g/s:	0.022	Stdev %:	40%	Avg HC-$HC_{CO:}$	0.024		
HC vs. CO:	A:	1.09	B:	0.024	R^2:	0.02	Stdev HC-$HC_{CO:}$ 0.010
HC vs. CO2	A:	3.14	B:	0.018	R^2:	0.14	Stdev HC-$HC_{CO2:}$ 0.009



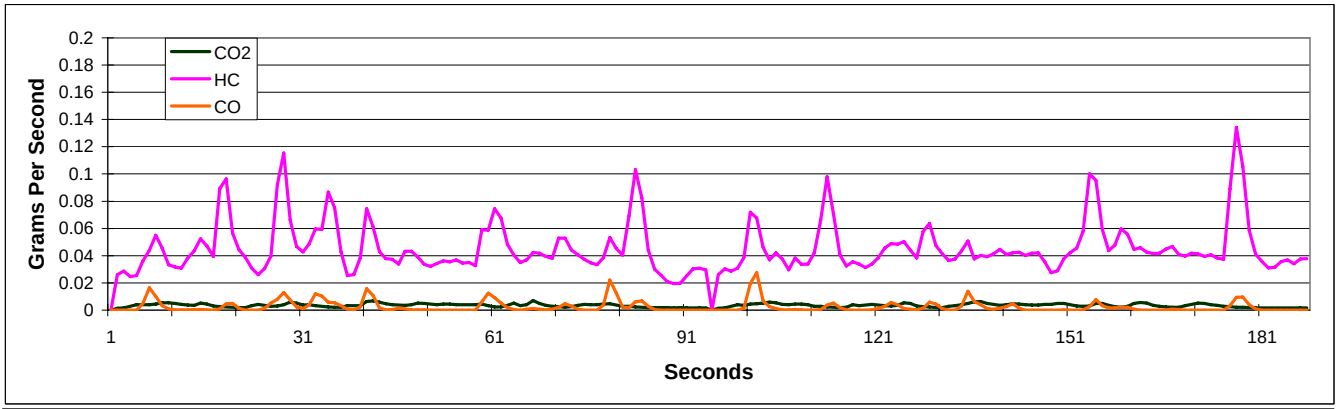


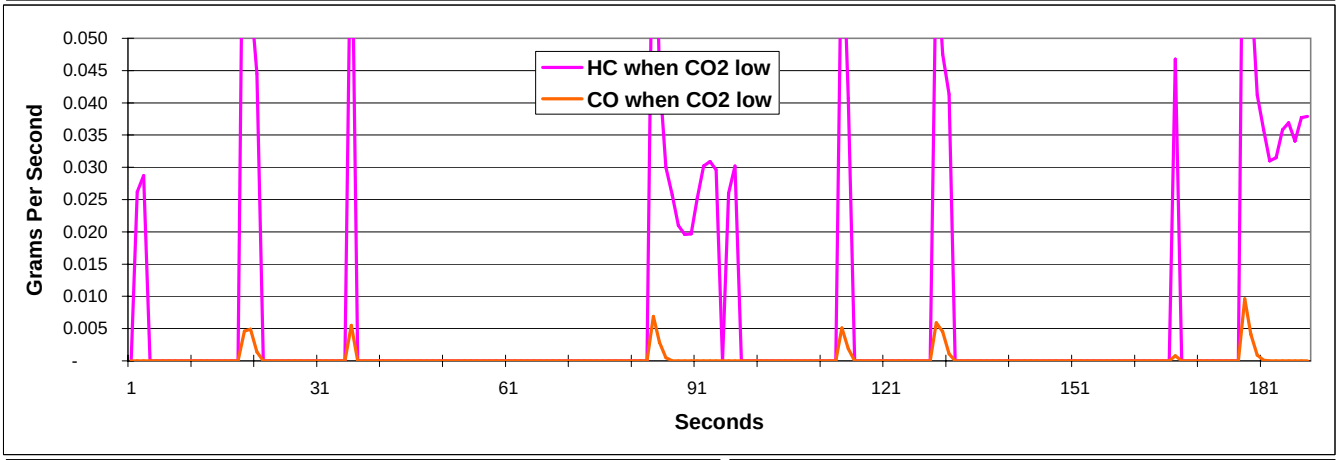


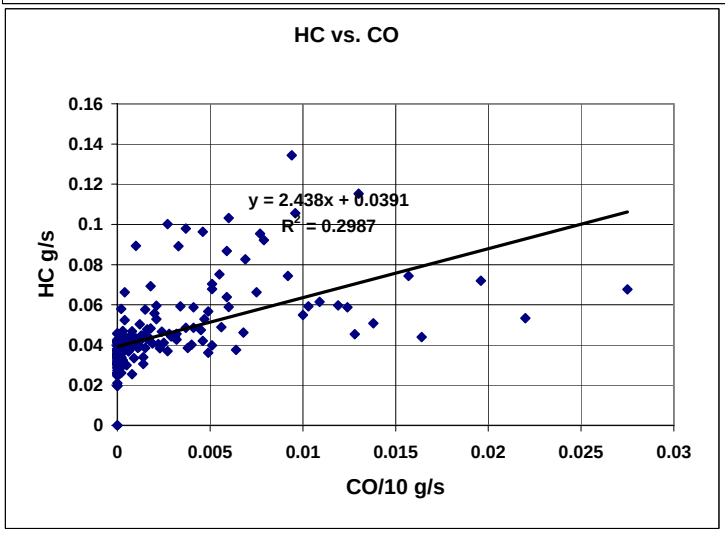


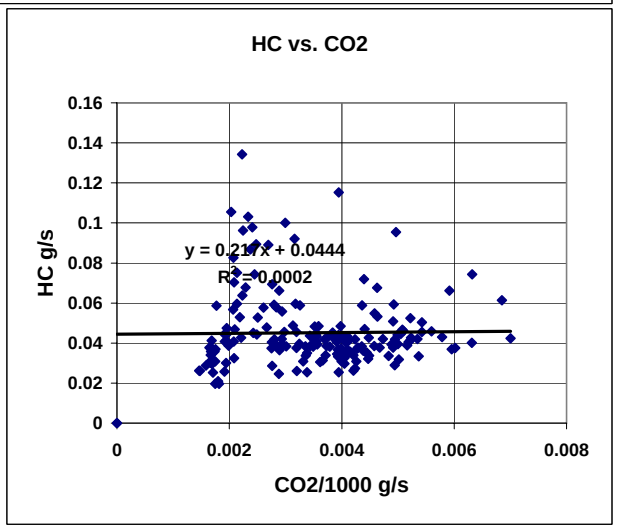
Ref: 8				**Leak predicted:**	Yes
Cert: 2975555	**VIN:** 1G2FS2387ML209231		**Make:** PONT		
Year: 1991	**Model:** FIREBI			**HC g/mi:**	7.70
	HCLP: Yes			**CO g/mi:**	4.20
	Note: from repair advisor diagnosis				

Avg HC when CO2 low g/s:		0.042	**Stdev %:**	52%	**Avg HC-HC_{CO_2}**	0.039	
HC vs. CO:	**A:**	2.44	**B:**	0.039	**R^2:**	0.30	**Stdev HC-HC_{CO_2}** 0.016
HC vs. CO2	**A:**	0.22	**B:**	0.044	**R^2:**	0.00	**Stdev HC-HC_{CO_2}** 0.019



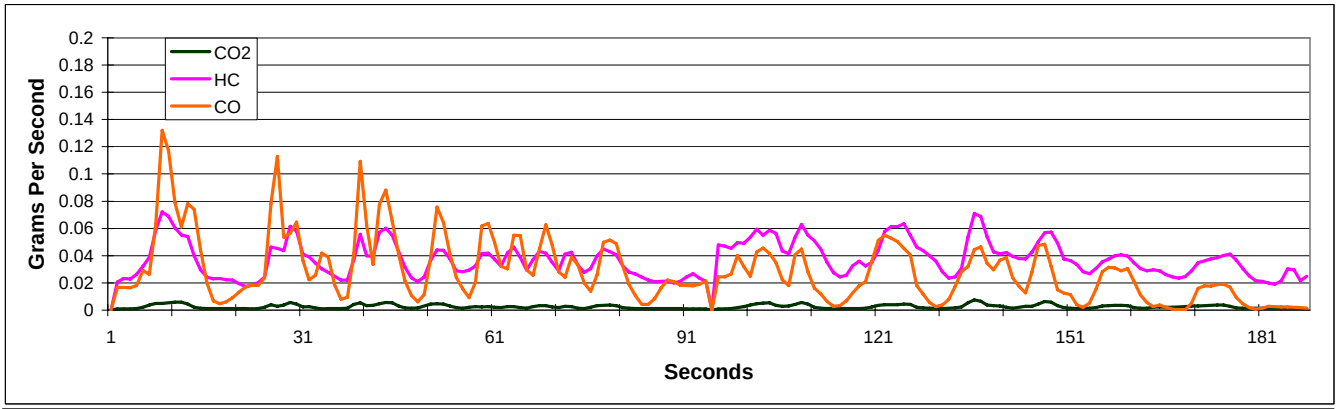


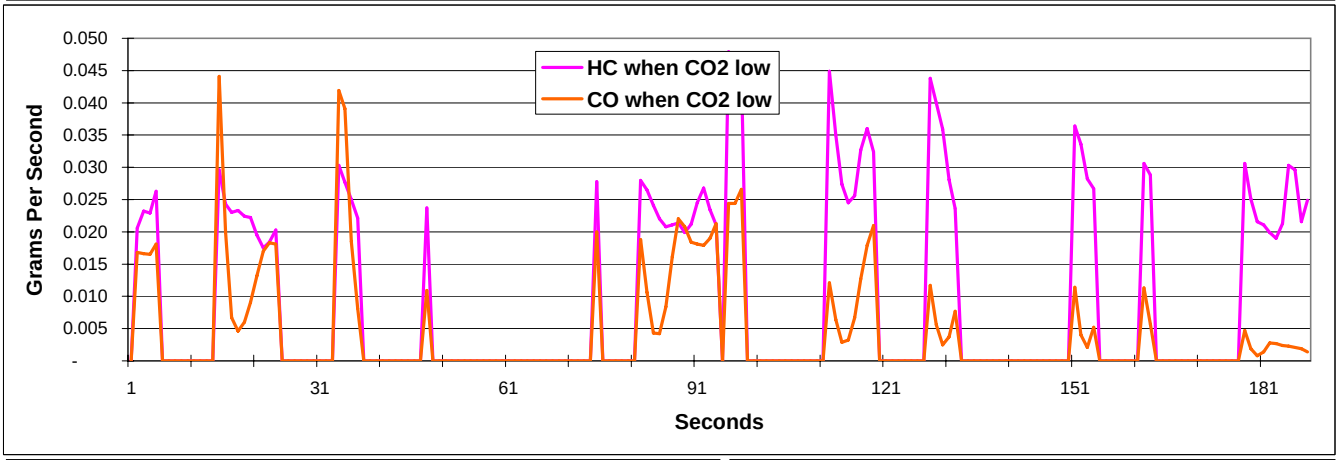


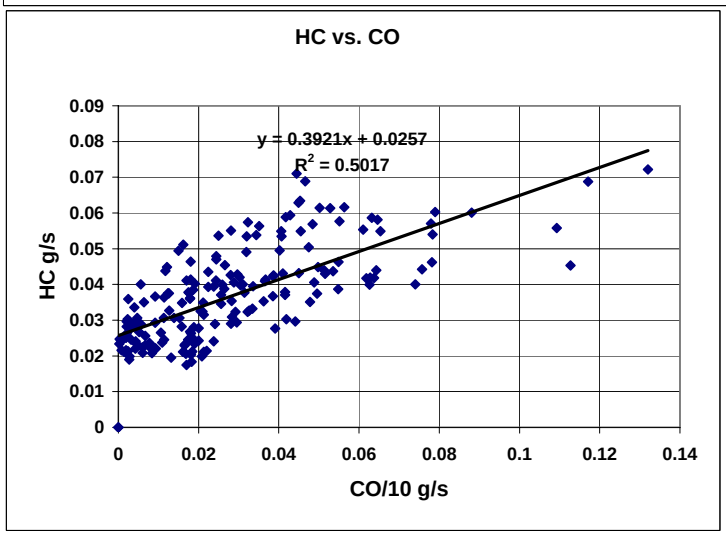


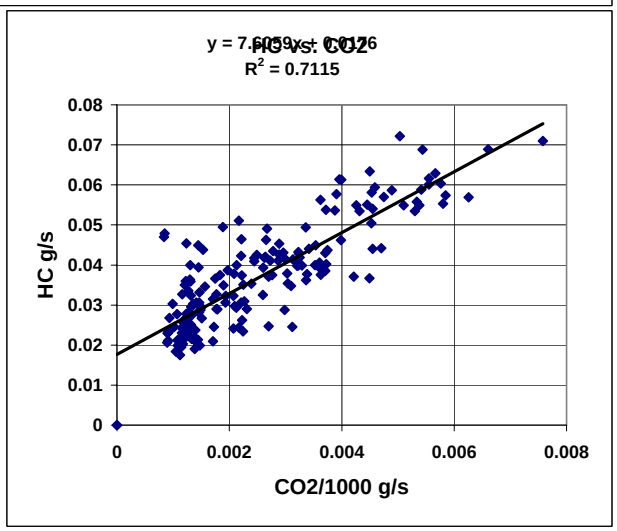
Ref: 9					**Leak predicted:** Yes
Cert: 3025656	**VIN:** 1G1FP23E8ML178695		**Make:** CHEV		
Year: 1991	**Model:** CAMARO			**HC g/mi:**	6.15
	HCLP: Yes			**CO g/mi:**	47.46
	Note: from repair advisor diagnosis				

Avg HC when CO2 low g/s:		**0.027**	**Stdev %:**	**30%**	**Avg HC-$HC_{CO:}$**	**0.026**	
HC vs. CO:	**A:**	**0.39**	**B:**	**0.026**	**R^2:**	**0.50**	**Stdev HC-$HC_{CO:}$** **0.009**
HC vs. CO2	**A:**	**7.61**	**B:**	**0.018**	**R^2:**	**0.71**	**Stdev HC-$HC_{CO2:}$** **0.007**





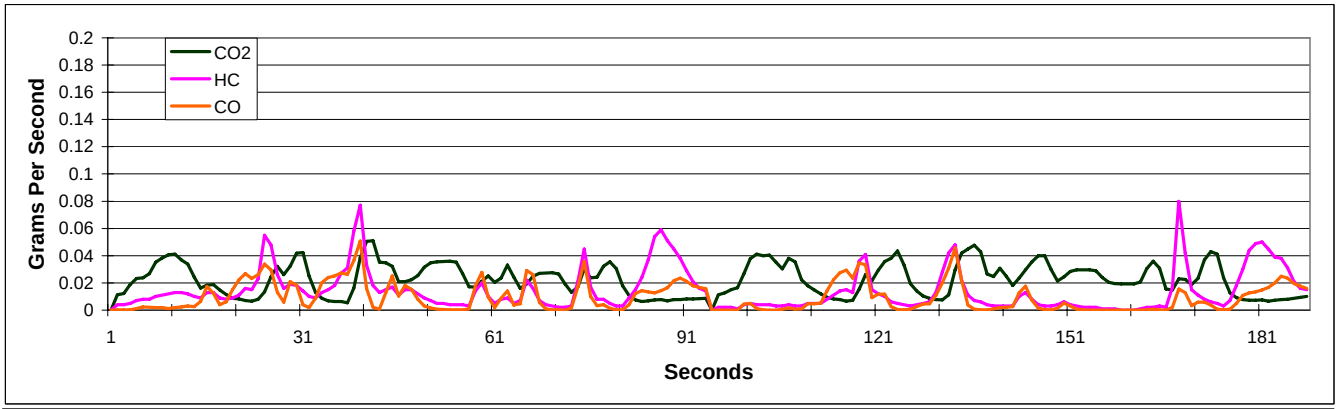


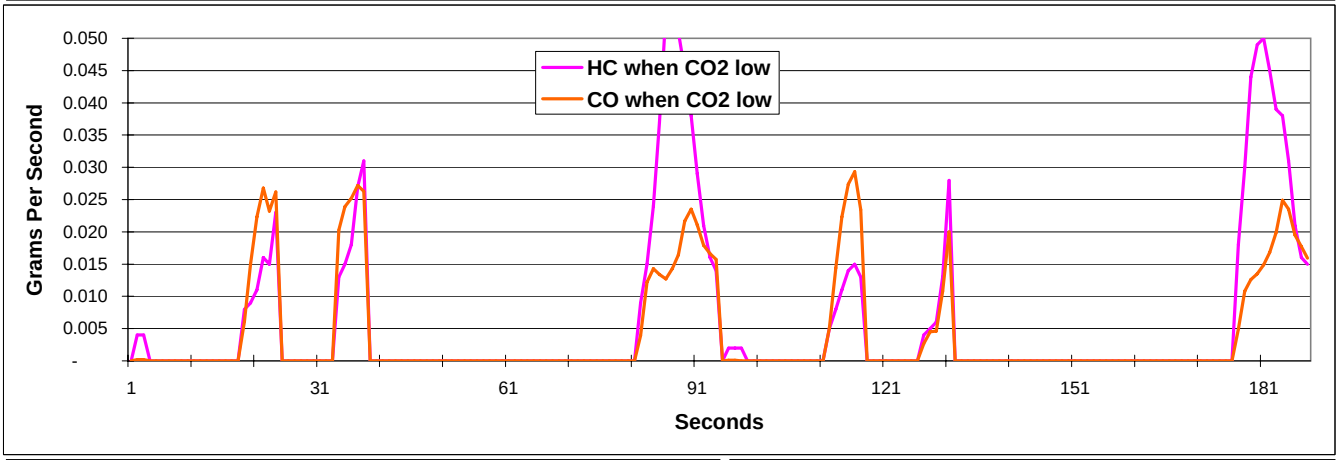


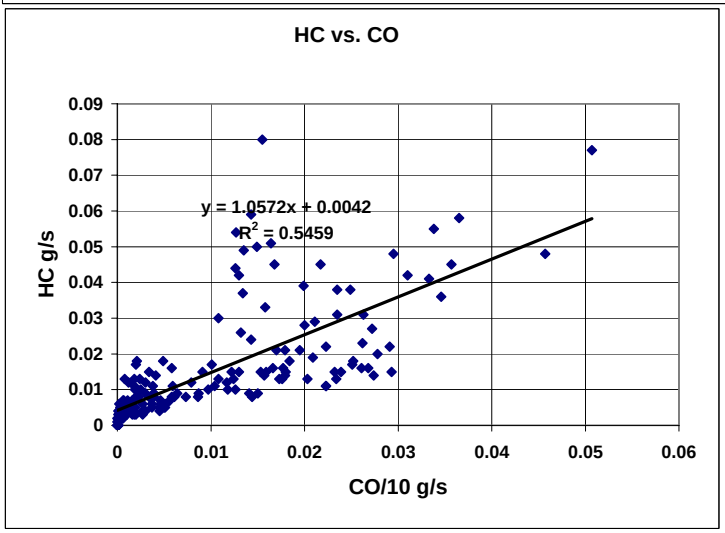
Ref: 10				**Leak predicted:** Yes	
Cert: 3026827	**VIN:** 1G1JF31W4K7152826		**Make:** CHEV		
Year: 1989	**Model:** CAVALI			**HC g/mi:**	2.40
	HCLP: Yes			**CO g/mi:**	15.93

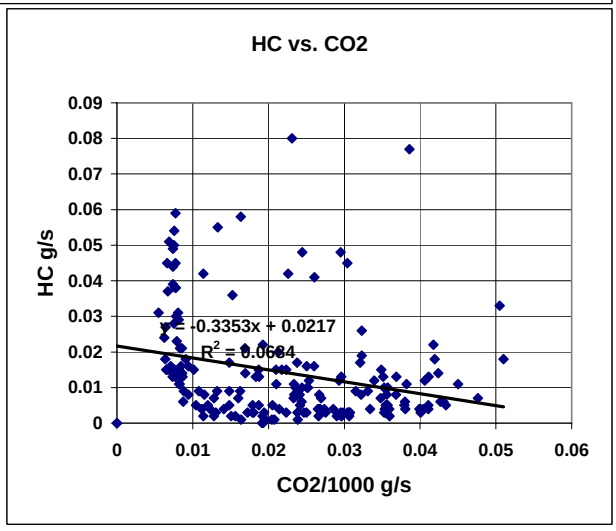
Note: response under middle of car - difficult to find. After RA run, wet gas line leak at frame rail near dr

Avg HC when CO2 low g/s:		**0.022**	**Stdev %:**	**71%**	**Avg HC-HC$_{CO_2}$**	**0.004**	
HC vs. CO:	**A:**	**1.06**	**B:**	**0.004**	**R^2:**	**0.55**	**Stdev HC-HC$_{CO_2}$** **0.010**
HC vs. CO2	**A:**	**(0.34)**	**B:**	**0.022**	**R^2:**	**0.07**	**Stdev HC-HC$_{CO_2}$** **0.015**



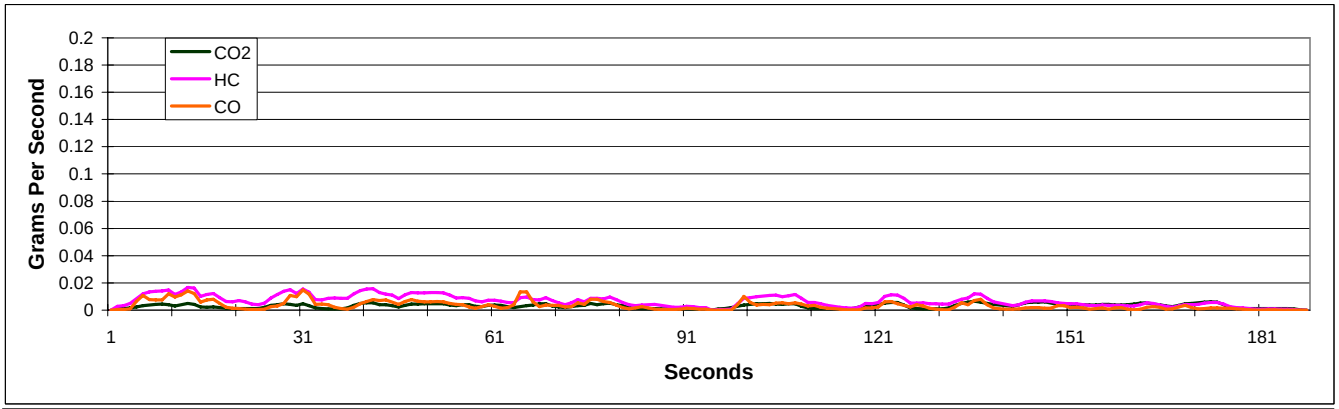


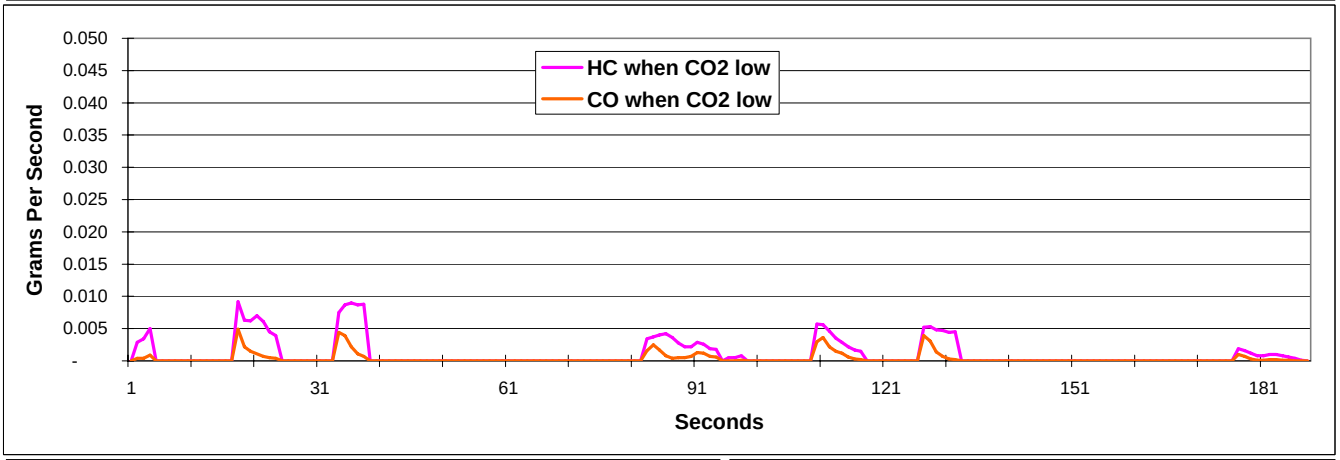


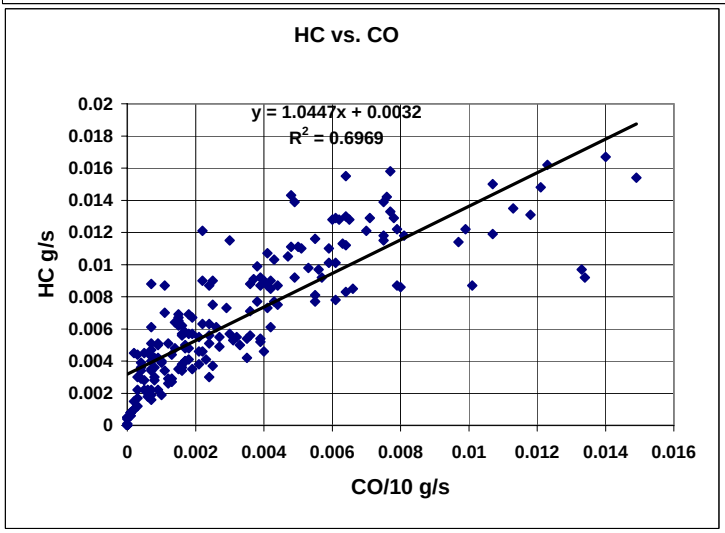


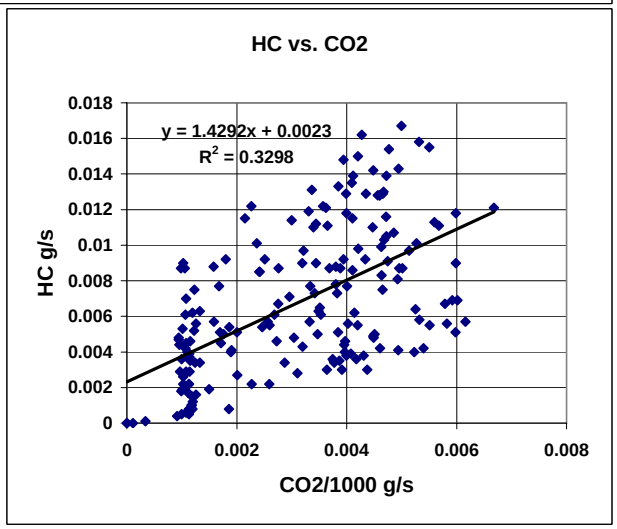
Ref: 11				**Leak predicted:**	No
Cert: 3008952	**VIN:** 2B3ED56TXPH520240		**Make:** DODG		
Year: 1993	**Model:** INTREP			**HC g/mi:**	1.13
	HCLP: No			**CO g/mi:**	5.70
	Note: 0				

Avg HC when CO2 low g/s:		**0.004**	**Stdev %:**	**75%**	**Avg HC-$HC_{CO:}$**	**0.003**	
HC vs. CO:	**A:**	**1.04**	**B:**	**0.003**	**R^2:**	**0.70**	**Stdev HC-$HC_{CO:}$** **0.002**
HC vs. CO2	**A:**	**1.43**	**B:**	**0.002**	**R^2:**	**0.33**	**Stdev HC-$HC_{CO2:}$** **0.003**



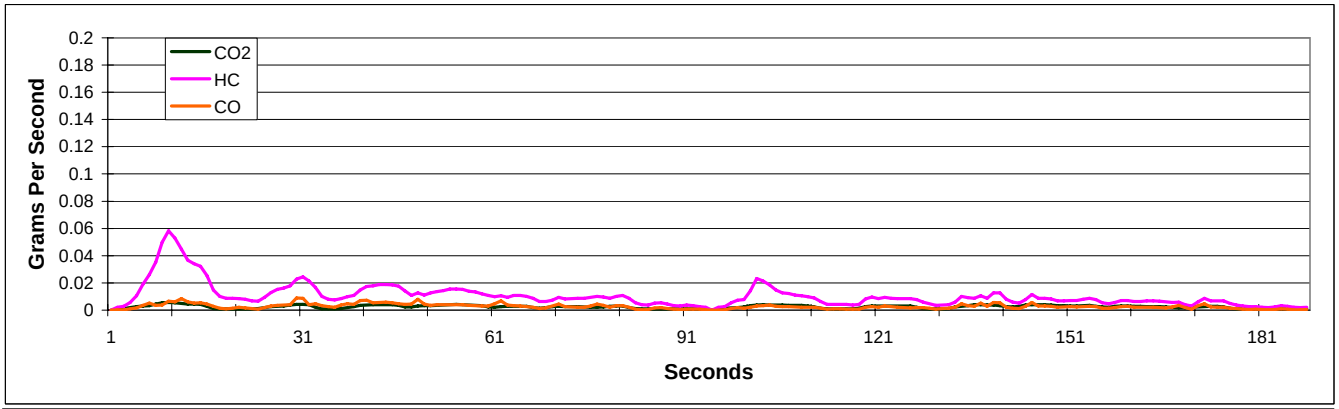


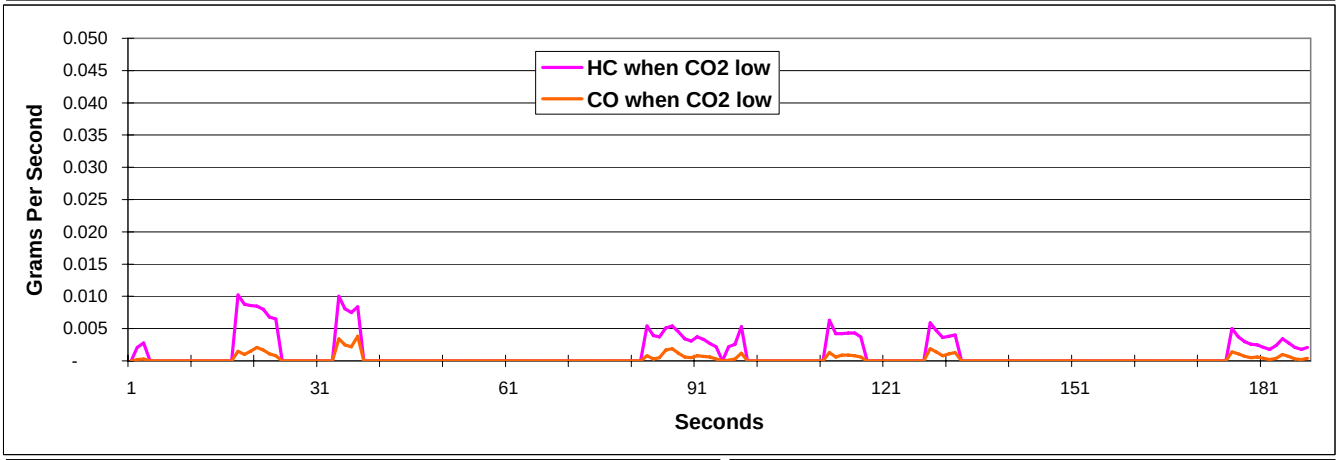


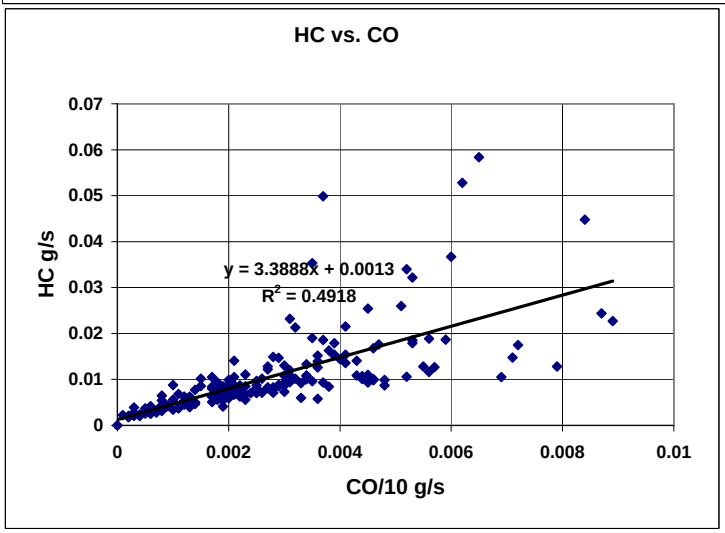


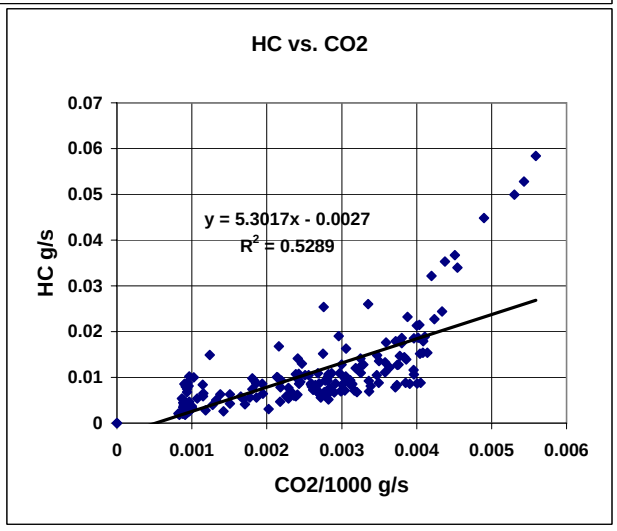
Ref: 12				**Leak predicted:**	No
Cert: 3033634	**VIN:** 1C3XU4533PF678976		**Make:** CHRY		
Year: 1993	**Model:** LEBARO			**HC g/mi:**	1.77
	HCLP: No			**CO g/mi:**	4.58
	Note: 0				

Avg HC when CO2 low g/s:		**0.005**	**Stdev %:**	**52%**	**Avg HC-$HC_{CO:}$**	**0.001**		
HC vs. CO:	**A:**	**3.39**	**B:**	**0.001**	**R^2:**	**0.49**	**Stdev HC-$HC_{CO:}$**	**0.006**
HC vs. CO2	**A:**	**5.30**	**B:**	**(0.003)**	**R^2:**	**0.53**	**Stdev HC-$HC_{CO2:}$**	**0.006**



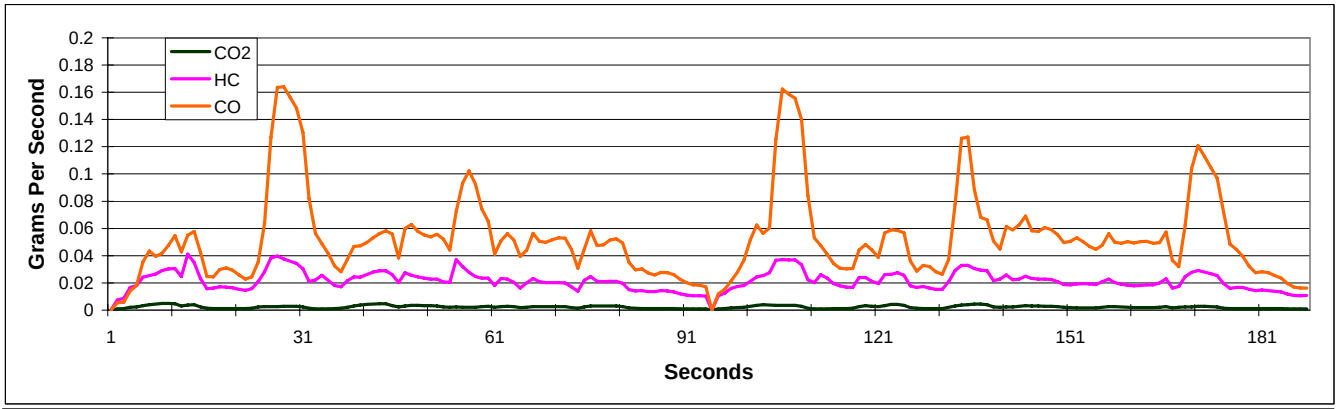


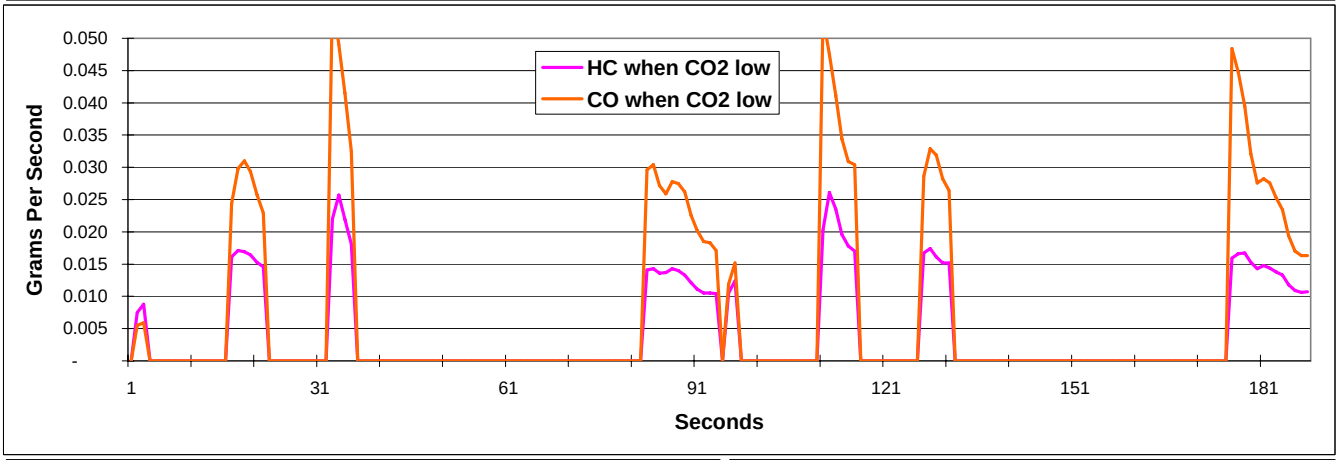


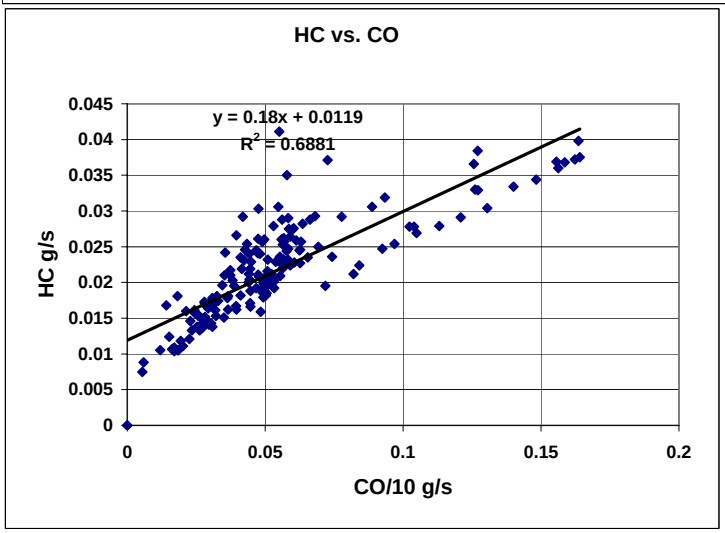


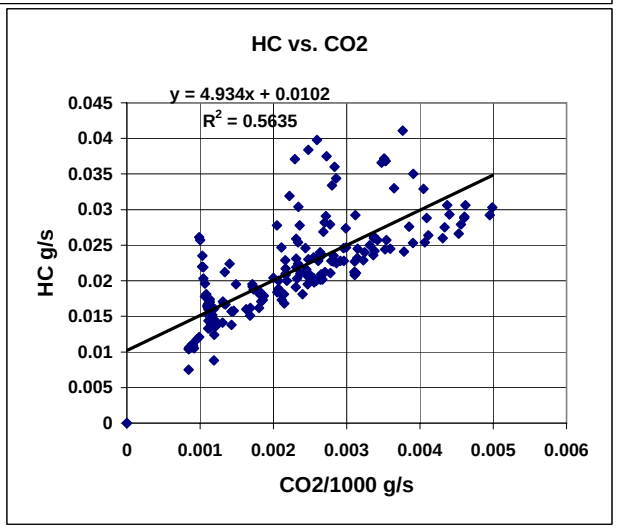
Ref: 13				Leak predicted:	No
Cert: 3007174	VIN: 1G4HR54C6MH424649		Make: BUIC		
Year: 1991	Model: LESABR			HC g/mi:	3.58
	HCLP: No			CO g/mi:	88.48
	Note: 0				

Avg HC when CO2 low g/s:		0.015	Stdev %:	29%	Avg HC-$HC_{CO:}$	0.012	
HC vs. CO:	A:	0.18	B:	0.012	R^2:	0.69	Stdev HC-$HC_{CO:}$ 0.004
HC vs. CO2	A:	4.93	B:	0.010	R^2:	0.56	Stdev HC-$HC_{CO2:}$ 0.005









Ref: 14 | Leak predicted: Yes

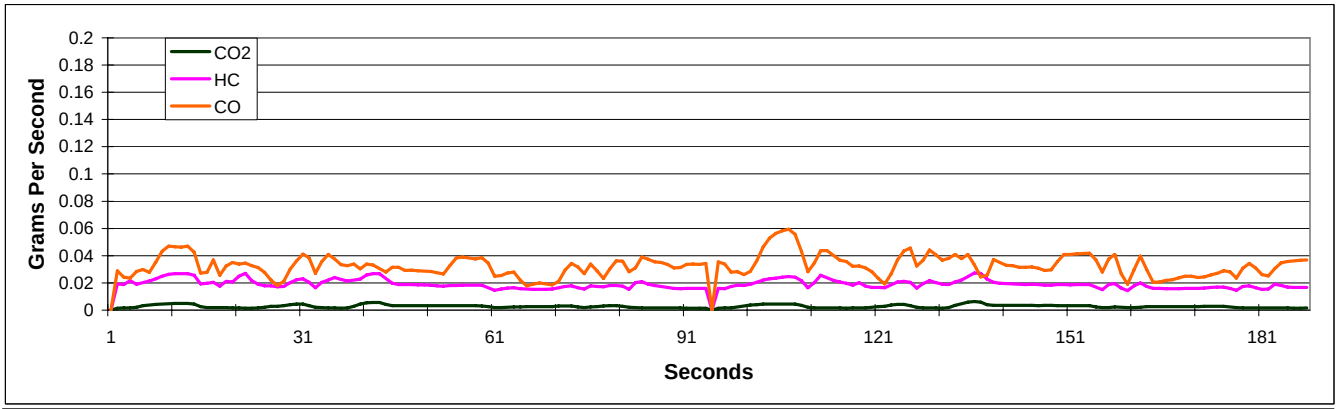
Cert: 3027683 | VIN: 1G3GR11Y2HP342504 | Make: OLDS

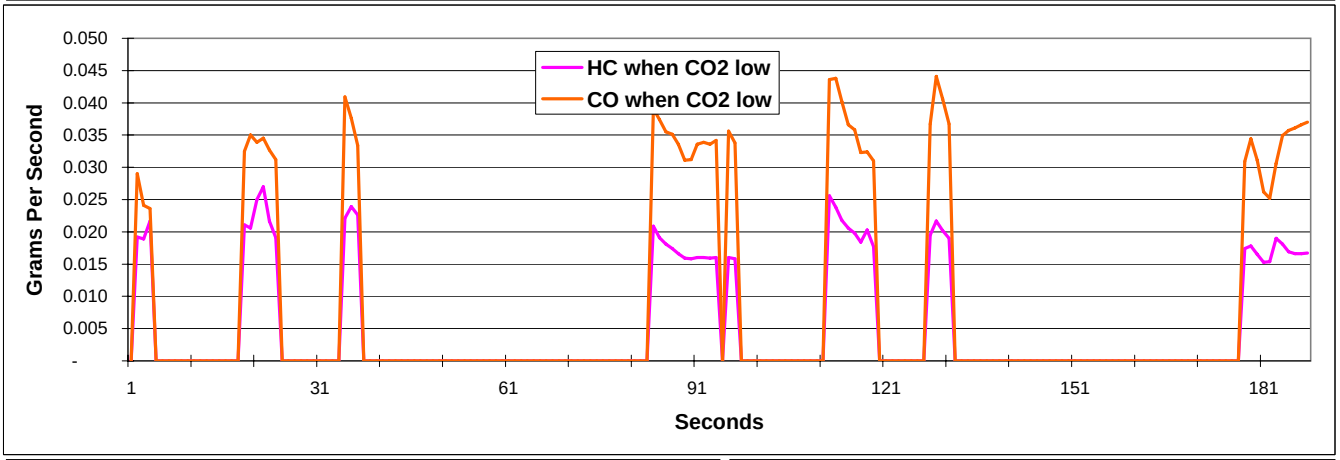
Year: 1987 | Model: CUTLAS | HC g/mi: 3.20

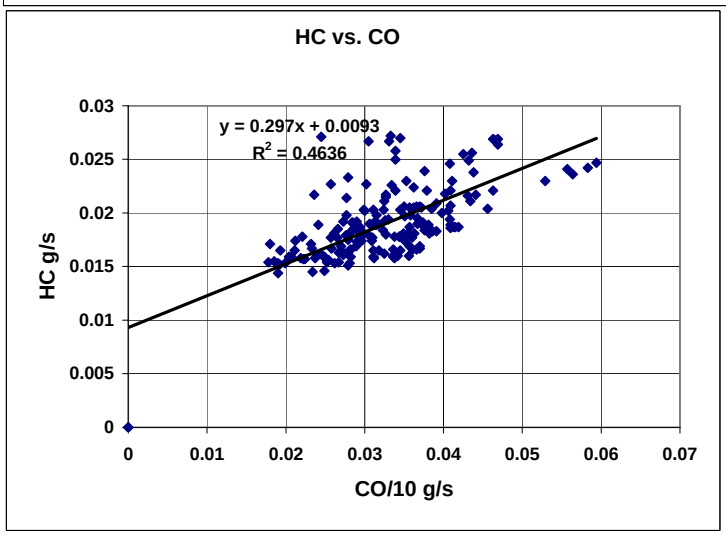
HCLP: Yes | CO g/mi: 54.75

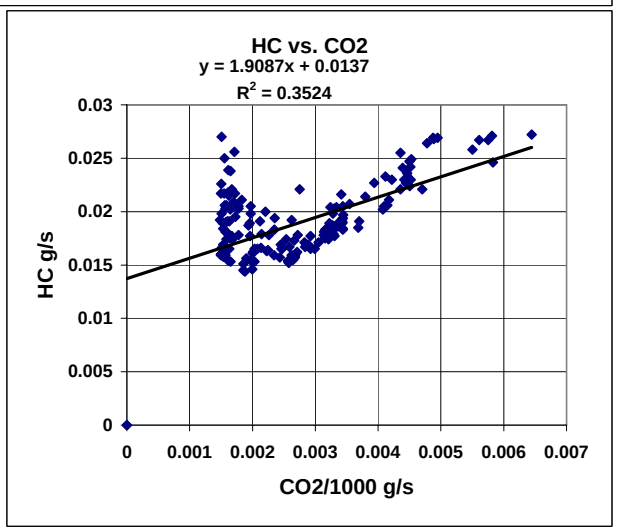
Note: slight response at carb and canister - (early 70s open loop carb'd Pontiac engine)

Avg HC when CO2 low g/s:		0.019	Stdev %:	22%	Avg HC-$HC_{CO:}$	0.009		
HC vs. CO:	A:	0.30	B:	0.009	R^2:	0.46	Stdev HC-$HC_{CO:}$	0.003
HC vs. CO2	A:	1.91	B:	0.014	R^2:	0.35	Stdev HC-$HC_{CO2:}$	0.003



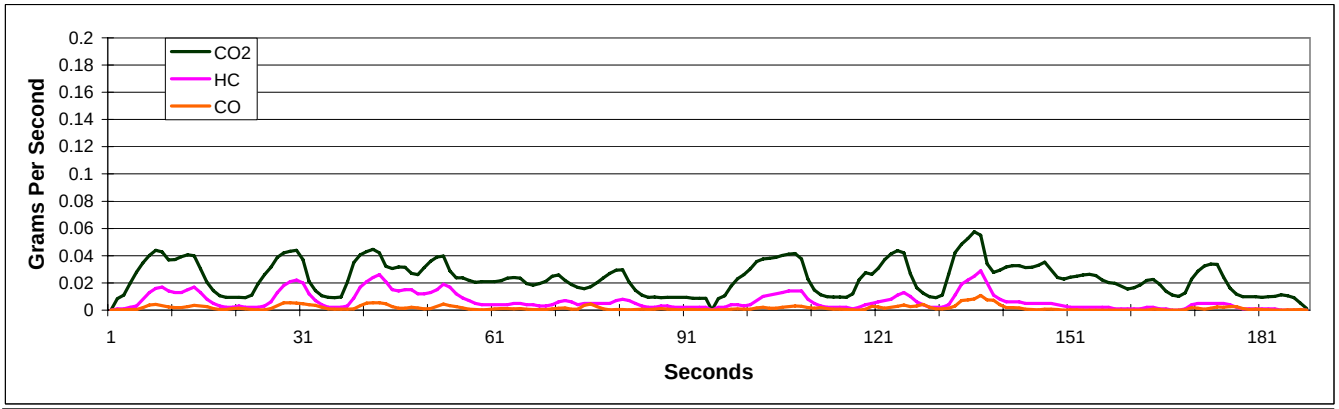


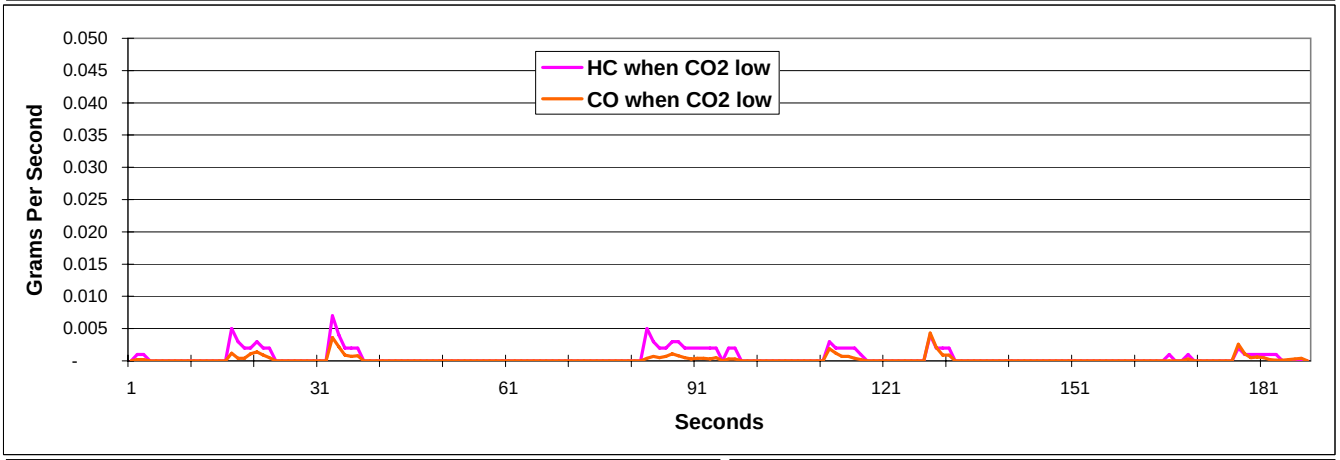


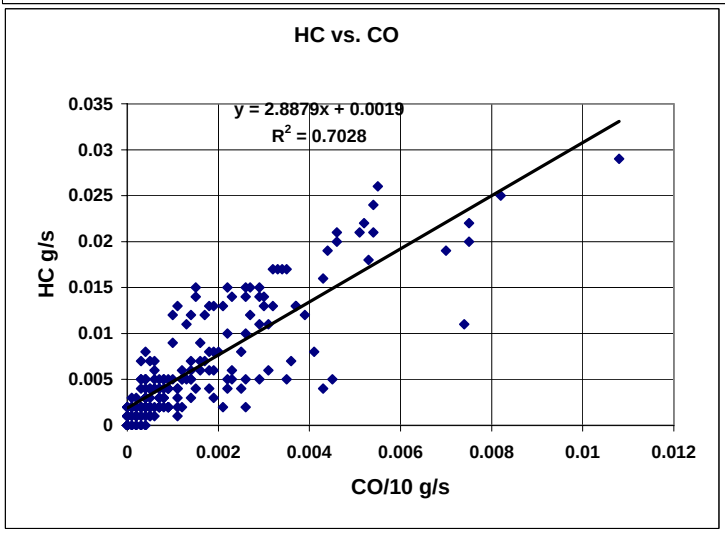


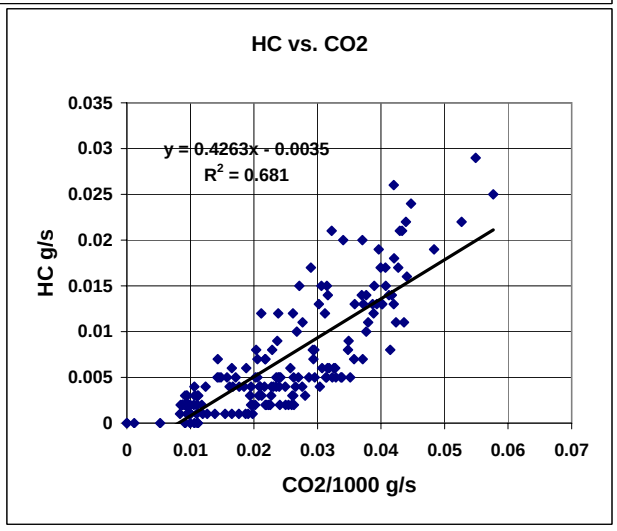
Ref: 15				**Leak predicted:**	No
Cert: 3028993	**VIN:** 1G3WH52M5SF307938		**Make:** OLDS		
Year: 1995	**Model:** CUTLAS			**HC g/mi:**	1.10
	HCLP: Yes			**CO g/mi:**	2.71
	Note: response at canister hoses LR fender				

Avg HC when CO2 low g/s:		**0.002**	**Stdev %:**	**71%**	**Avg HC-$HC_{CO:}$**	**0.002**	
HC vs. CO:	**A:**	**2.89**	**B:**	**0.002**	**R^2:**	**0.70**	**Stdev HC-$HC_{CO:}$** **0.003**
HC vs. CO2	**A:**	**0.43**	**B:**	**(0.003)**	**R^2:**	**0.68**	**Stdev HC-$HC_{CO2:}$** **0.004**



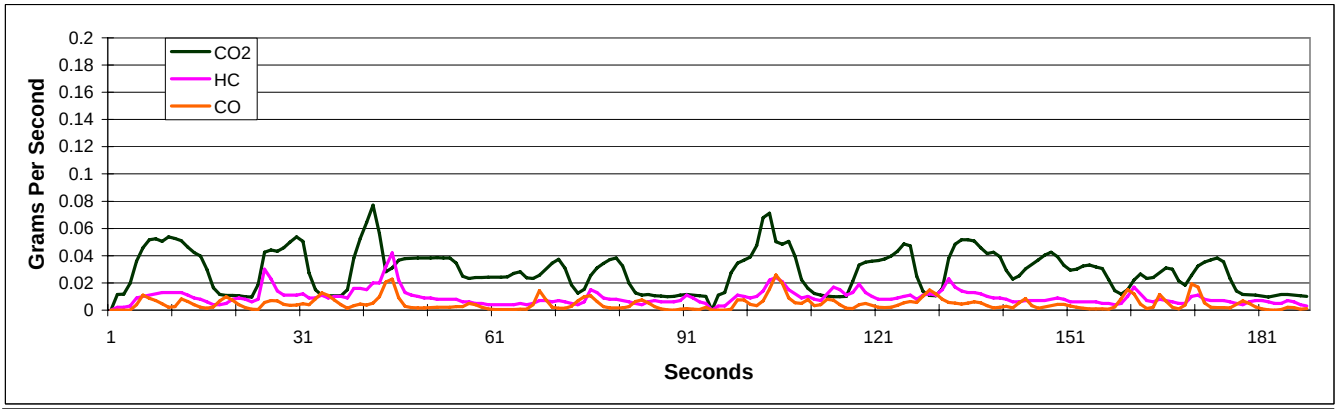


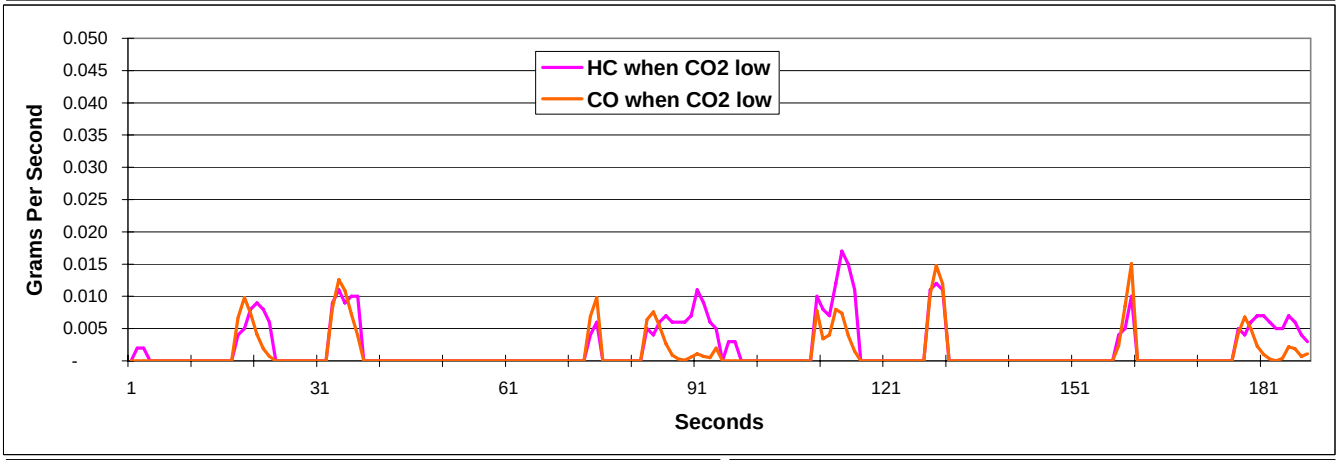


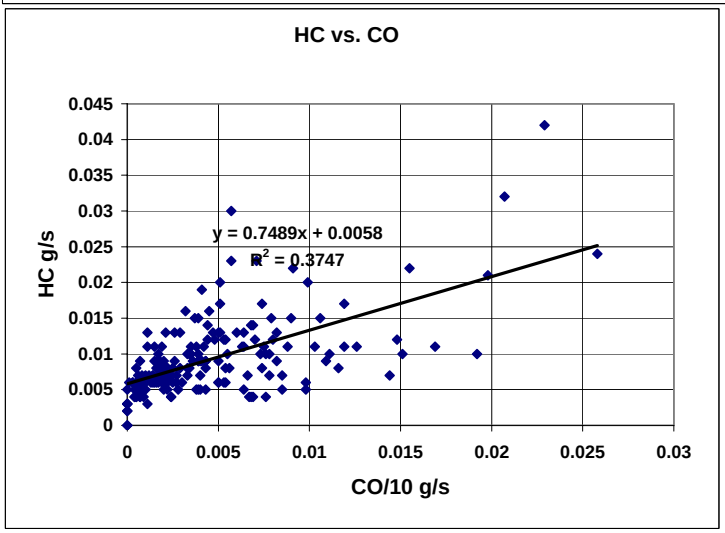


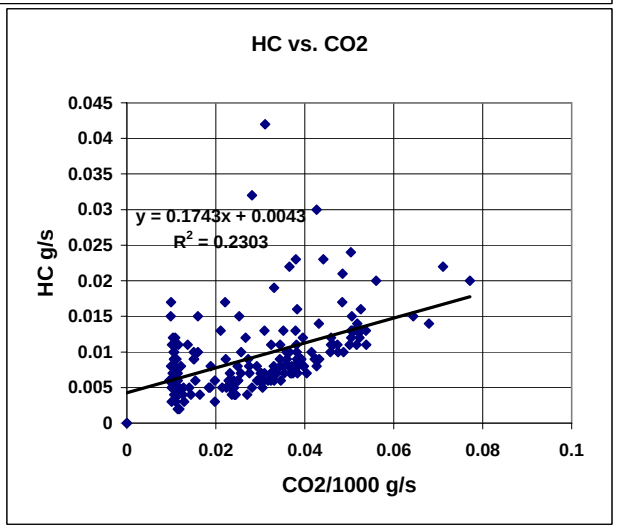
Ref: 16				**Leak predicted:**	No
Cert: 3028999	**VIN:** 1GNDM19W8PB183009		**Make:** CHEV		
Year: 1993	**Model:** ASTRO			**HC g/mi:**	1.54
	HCLP: No			**CO g/mi:**	7.64
	Note: 0				

Avg HC when CO2 low g/s:	0.007	**Stdev %:**	45%	**Avg HC-$HC_{CO:}$**	0.006		
HC vs. CO:	**A:** 0.75	**B:**	0.006	**R^2:**	0.37	**Stdev HC-$HC_{CO:}$**	0.004
HC vs. CO2	**A:** 0.17	**B:**	0.004	**R^2:**	0.23	**Stdev HC-$HC_{CO2:}$**	0.005



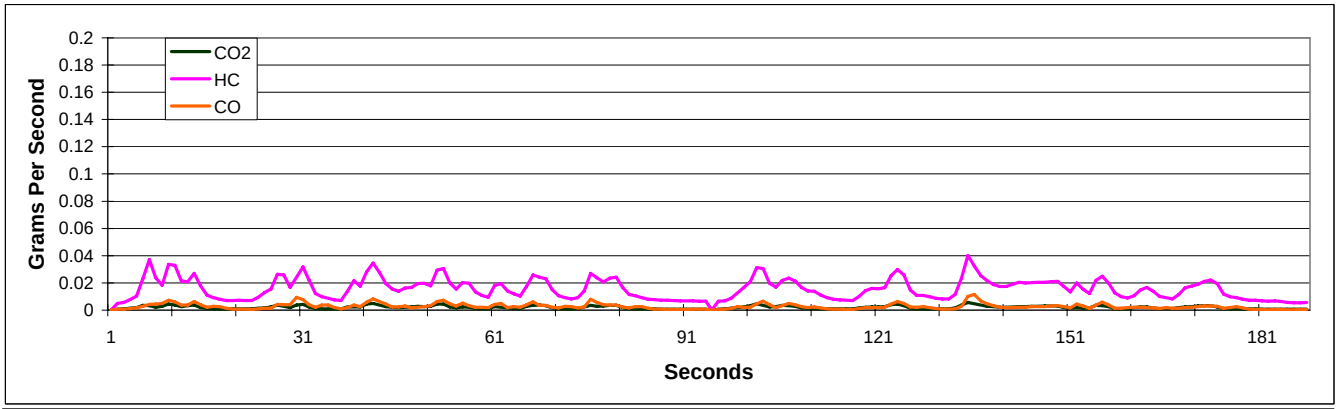


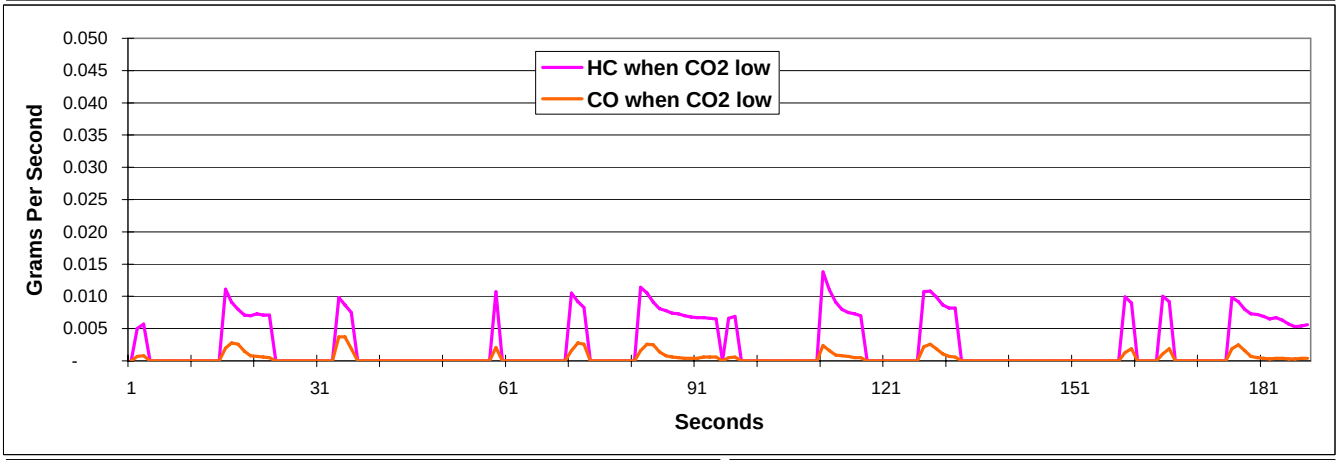


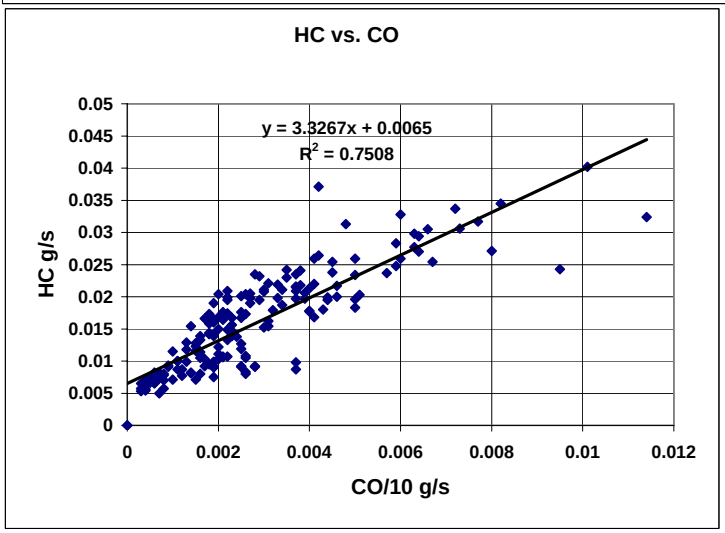


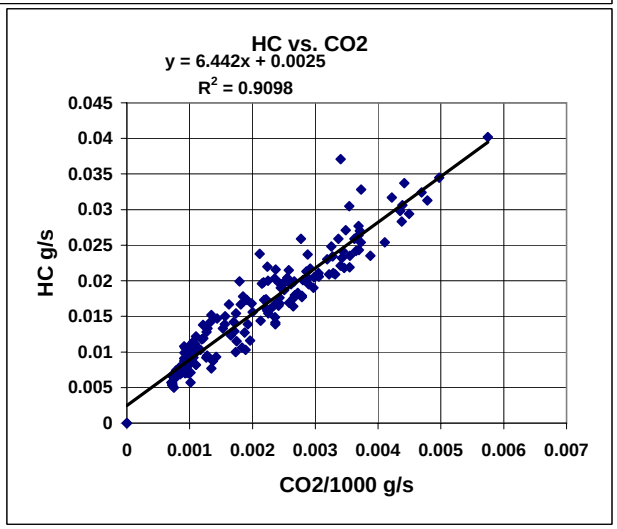
Ref: 18				**Leak predicted:**	No
Cert: 2983144	**VIN:** 1YVGD31AXK5230429		**Make:** MAZD		
Year: 1989	**Model:** MX-6			**HC g/mi:**	2.57
	HCLP: No			**CO g/mi:**	4.48
	Note: 0				

Avg HC when CO2 low g/s:		**0.008**	**Stdev %:**	**25%**	**Avg HC-$HC_{CO:}$**	**0.007**	
HC vs. CO:	**A:**	**3.33**	**B:**	**0.007**	**R^2:**	**0.75**	**Stdev HC-$HC_{CO:}$** **0.004**
HC vs. CO2	**A:**	**6.44**	**B:**	**0.002**	**R^2:**	**0.91**	**Stdev HC-$HC_{CO2:}$** **0.002**



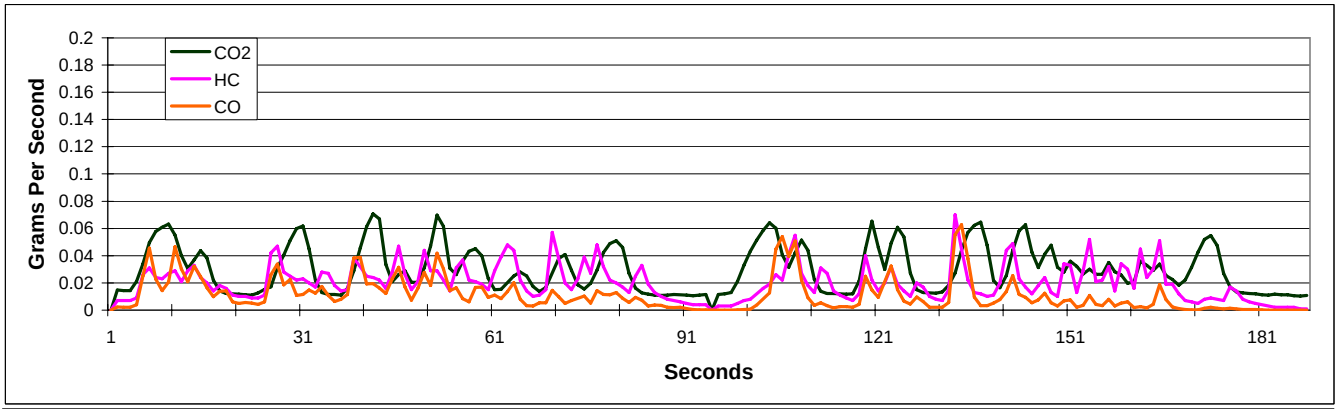


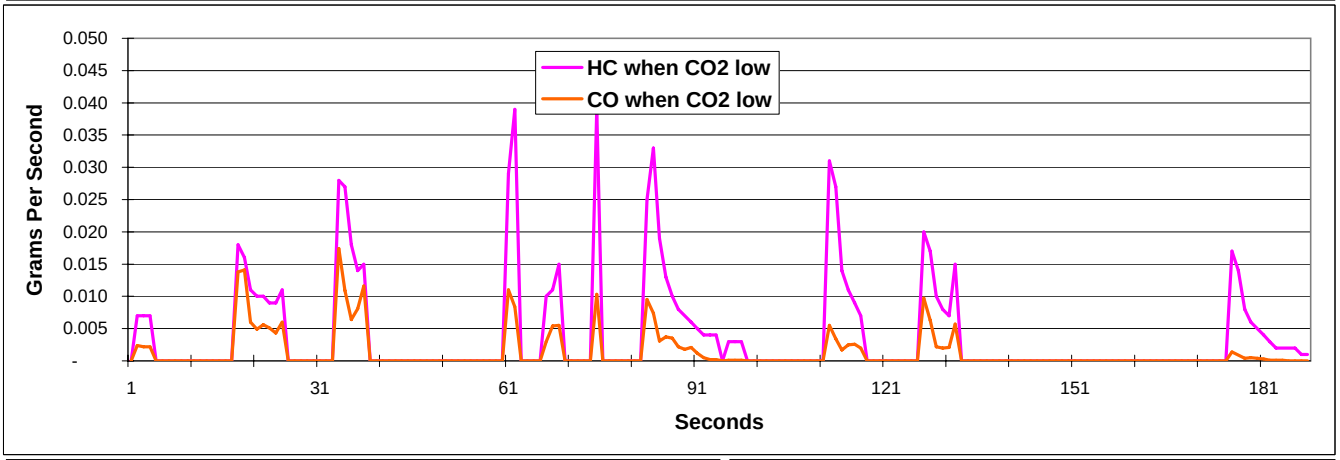


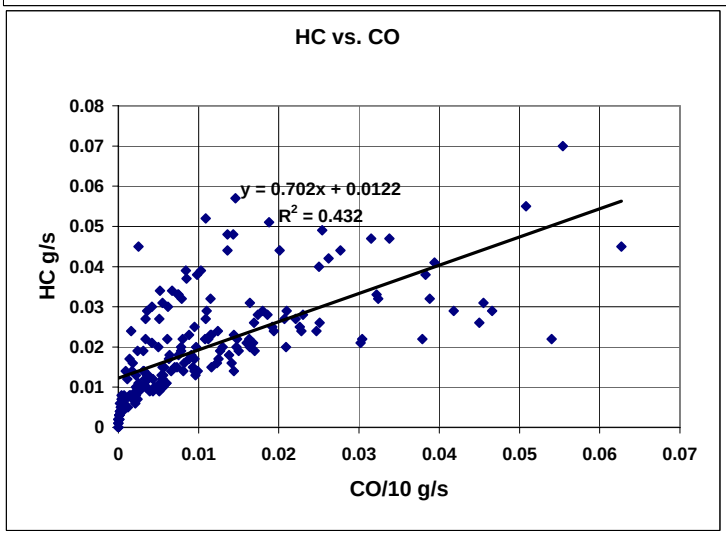


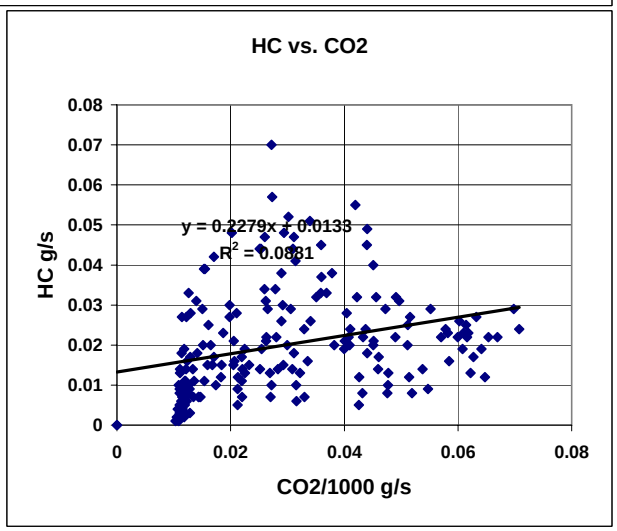
Ref: 19				**Leak predicted:**	Yes
Cert: 3029018	**VIN:** 1FTEF15Y2SLB27441		**Make:** FORD		
Year: 1995	**Model:** F150 R			**HC g/mi:**	3.32
	HCLP: No			**CO g/mi:**	18.43
	Note: 0				

Avg HC when CO2 low g/s:		0.012	**Stdev %:**	79%	**Avg HC-$HC_{CO:}$**	0.012	
HC vs. CO:	**A:**	0.70	**B:**	0.012	**R^2:**	0.43	**Stdev HC-$HC_{CO:}$** 0.010
HC vs. CO2	**A:**	0.23	**B:**	0.013	**R^2:**	0.09	**Stdev HC-$HC_{CO2:}$** 0.013



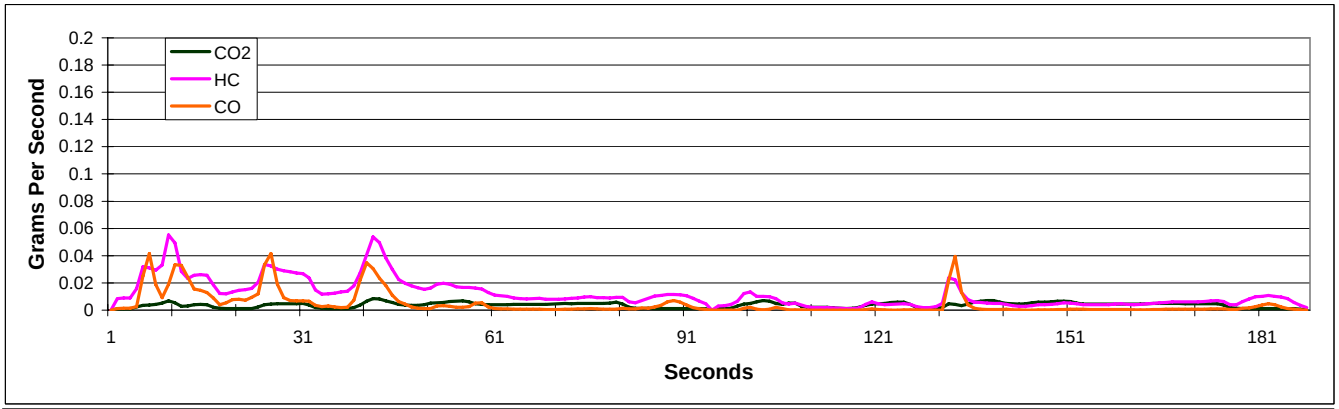


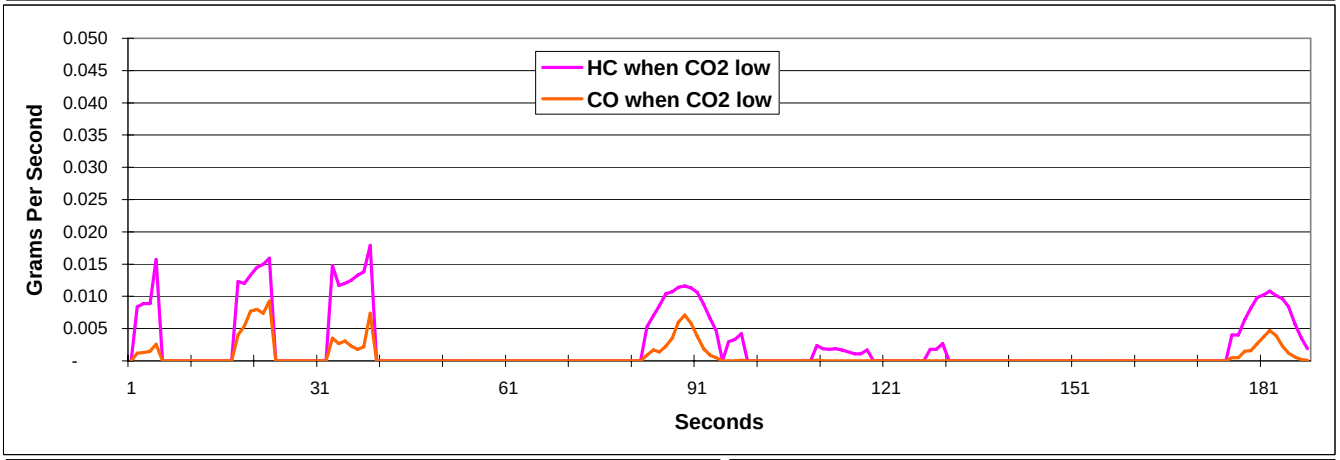


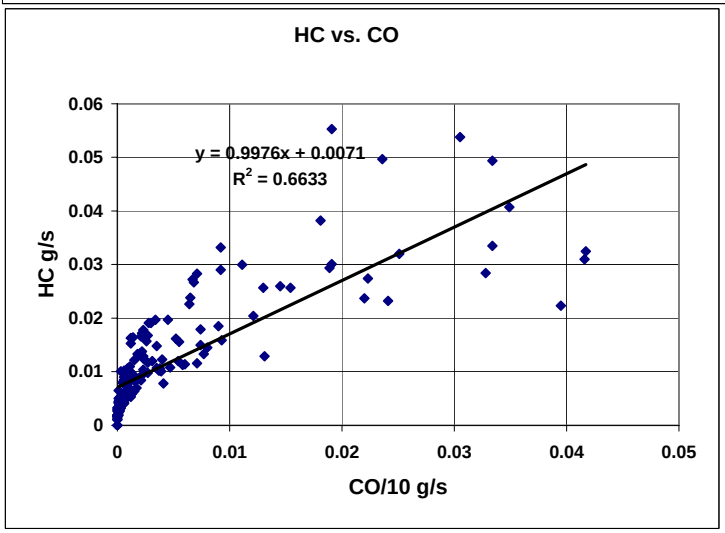


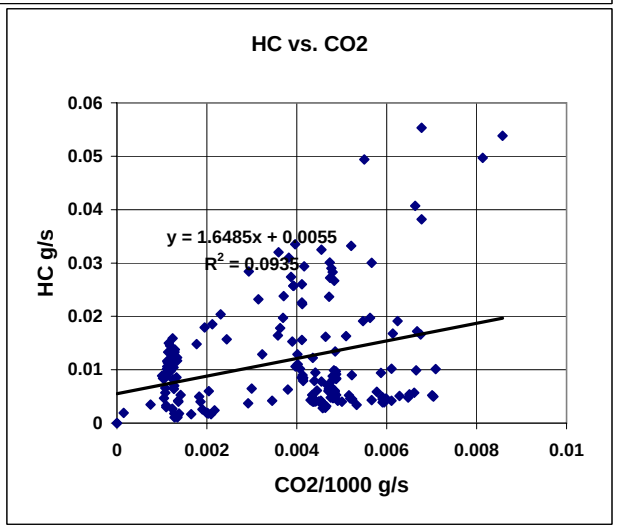
Ref: 20				Leak predicted:	No
Cert: 2916416	VIN: 1G4BN537XNR427488		Make: BUIC		
Year: 1992	Model: ROADMA			HC g/mi:	1.94
	HCLP: No			CO g/mi:	7.56
	Note: 0				

Avg HC when CO2 low g/s:	0.008	Stdev %:	64%	Avg HC-$HC_{CO:}$	0.007		
HC vs. CO:	A:	1.00	B:	0.007	R^2:	0.66	Stdev HC-$HC_{CO:}$	0.006
HC vs. CO2	A:	1.65	B:	0.005	R^2:	0.09	Stdev HC-$HC_{CO2:}$	0.010









Ref: 21 | Leak predicted: No

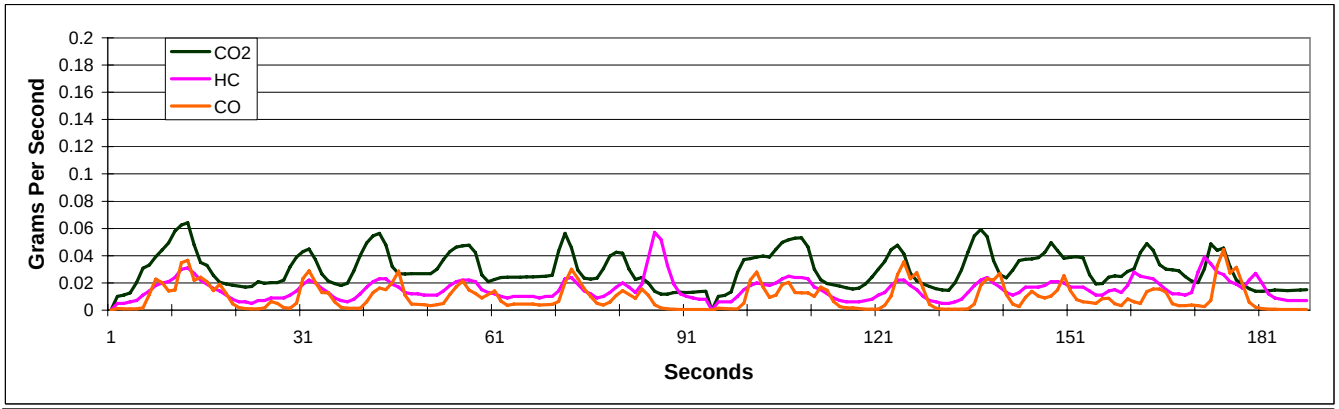
Cert: 3029021 | VIN: 1LNBP96F1DY684208 | Make: LINC

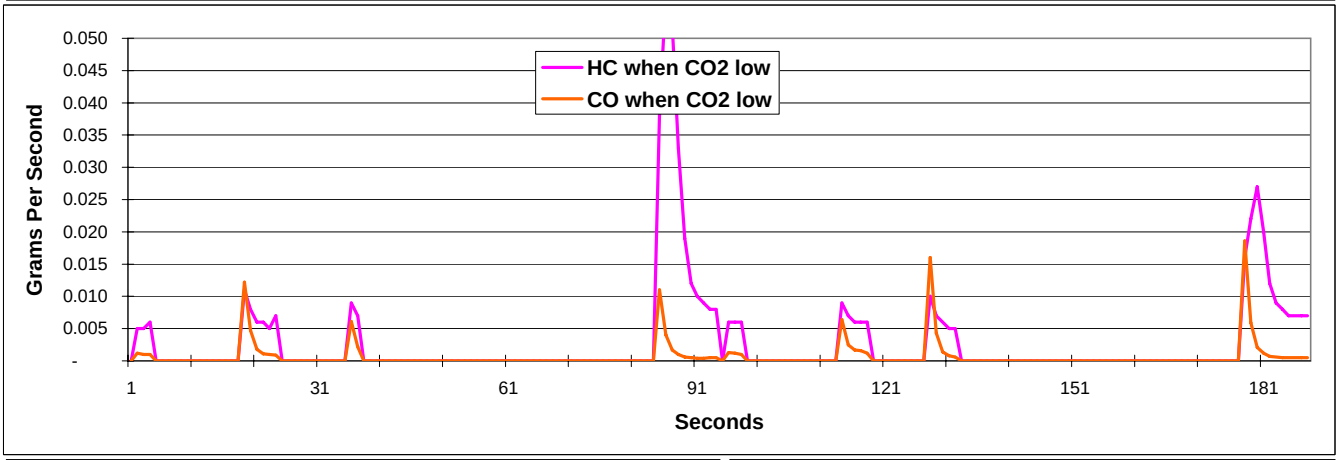
Year: 1983 | Model: TOWN C | HC g/mi: 2.57

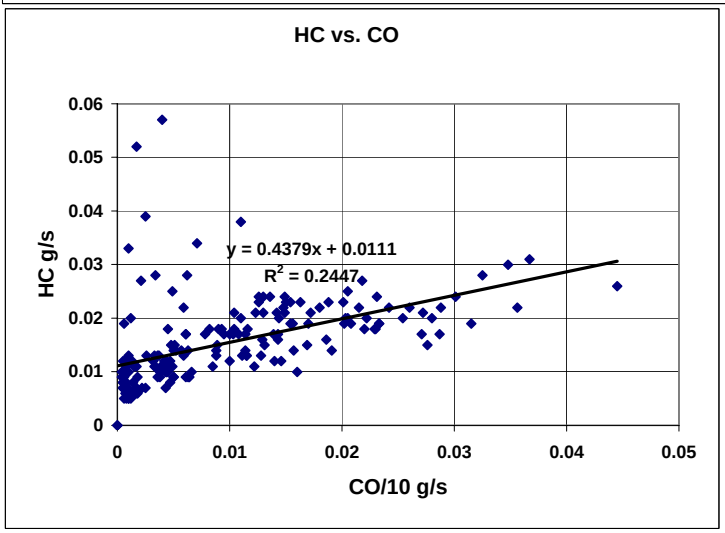
HCLP: Yes | CO g/mi: 16.28

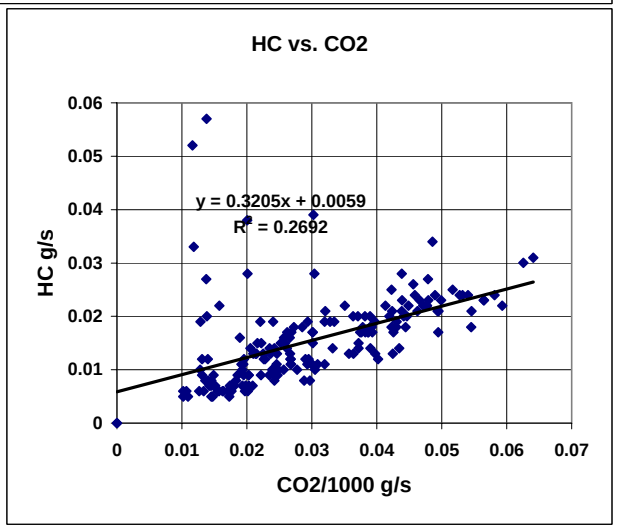
Note: significant leak at gas cap - very high pressure on removal. Cracks at edge of gasket - cap seals near

Avg HC when CO2 low g/s:		0.012	Stdev %:	98%	Avg HC-$HC_{CO:}$	0.011		
HC vs. CO:	A:	0.44	B:	0.011	R^2:	0.24	Stdev HC-$HC_{CO:}$	0.007
HC vs. CO2	A:	0.32	B:	0.006	R^2:	0.27	Stdev HC-$HC_{CO2:}$	0.007



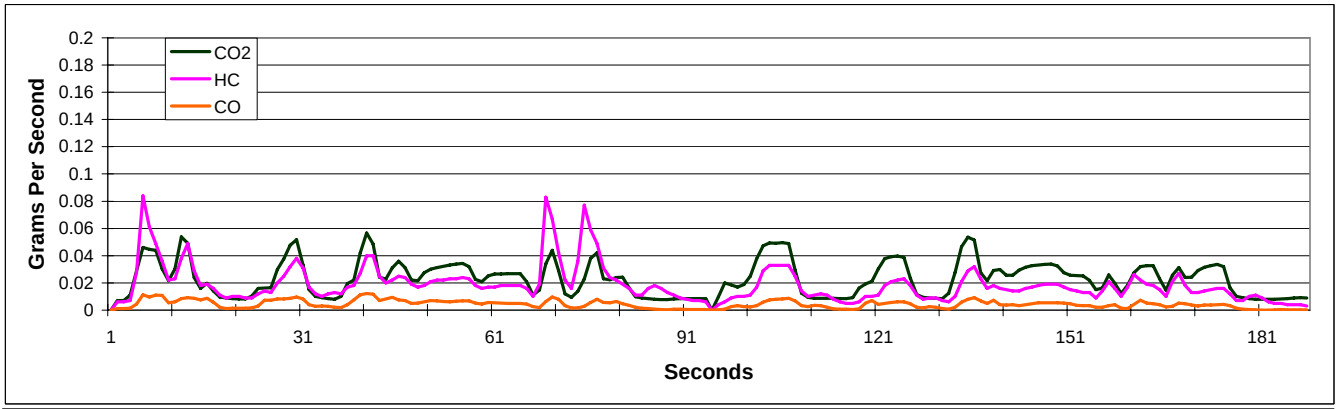


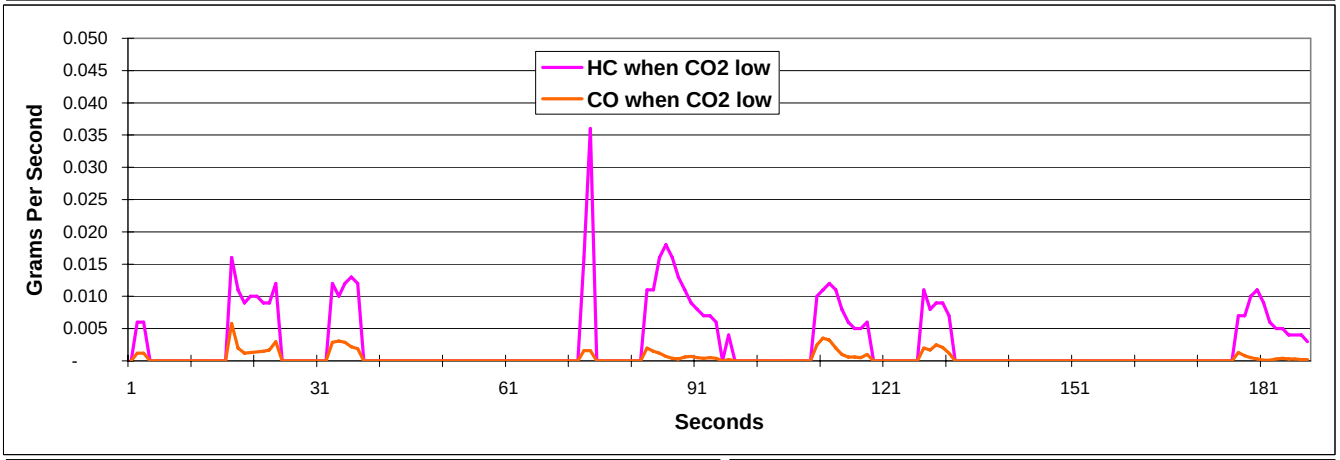


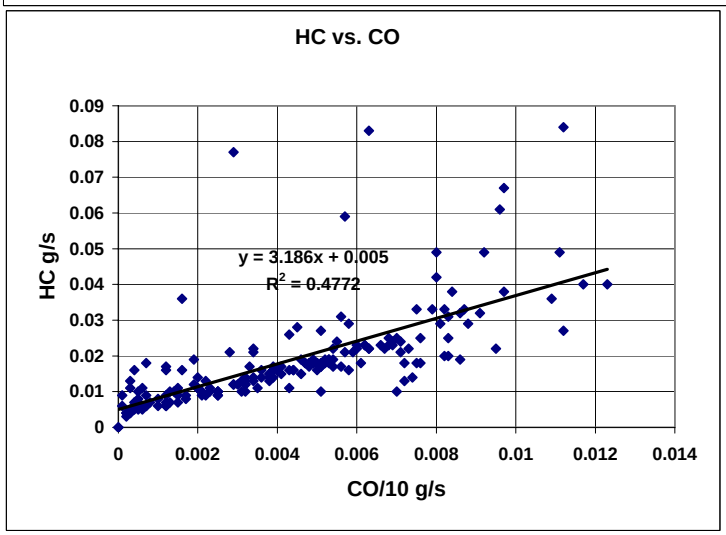


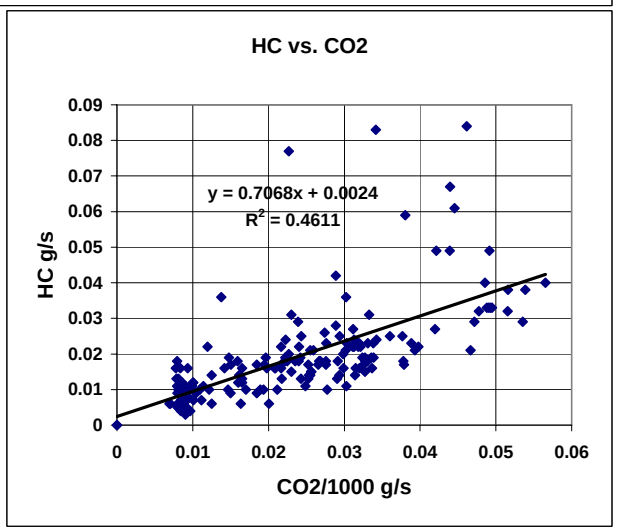
Ref: 23				**Leak predicted:** No	
Cert: 3029027	**VIN:** JB3BM54J1PY018792		**Make:** DODG		
Year: 1993	**Model:** STEALT			**HC g/mi:**	3.14
	HCLP: Yes			**CO g/mi:**	7.19
	Note: small response at gas cap and RR fender. Small response at intake by injectors.				

Avg HC when CO2 low g/s:	0.010	**Stdev %:**	54%	**Avg HC-$HC_{CO:}$**	0.005		
HC vs. CO:	**A:** 3.19	**B:**	0.005	**R^2:**	0.48	**Stdev HC-$HC_{CO:}$**	0.010
HC vs. CO2	**A:** 0.71	**B:**	0.002	**R^2:**	0.46	**Stdev HC-$HC_{CO2:}$**	0.010



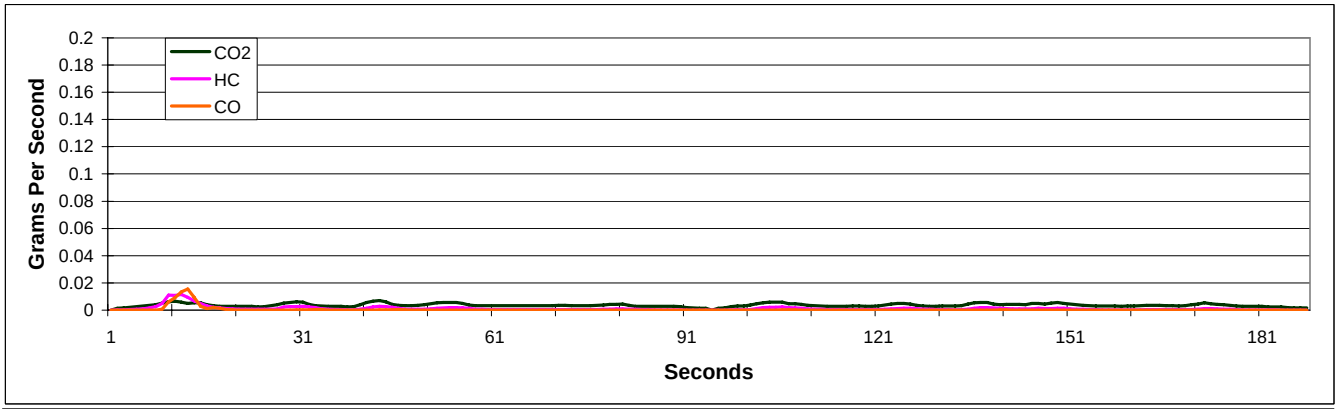


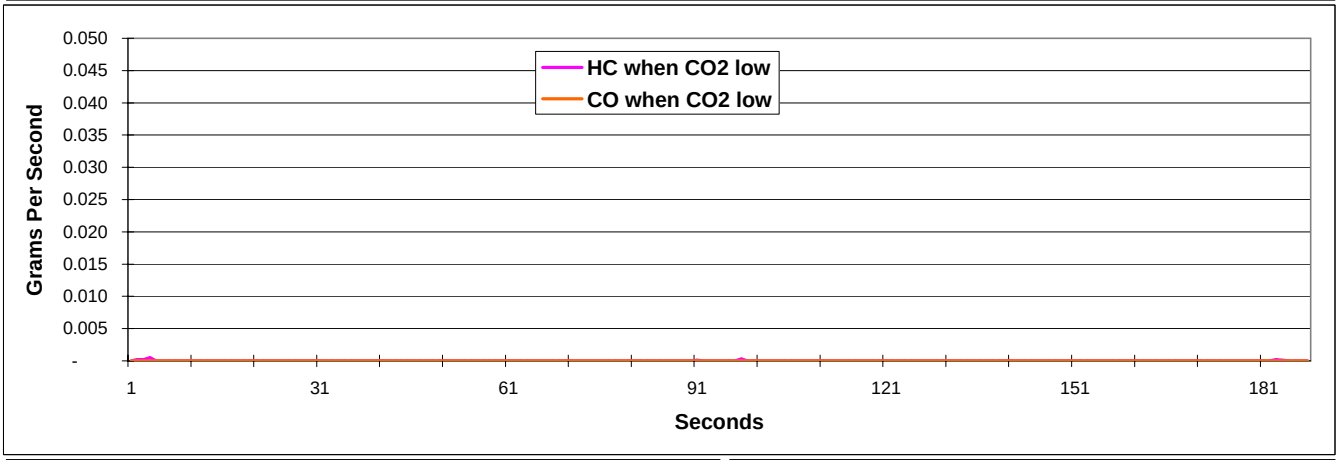


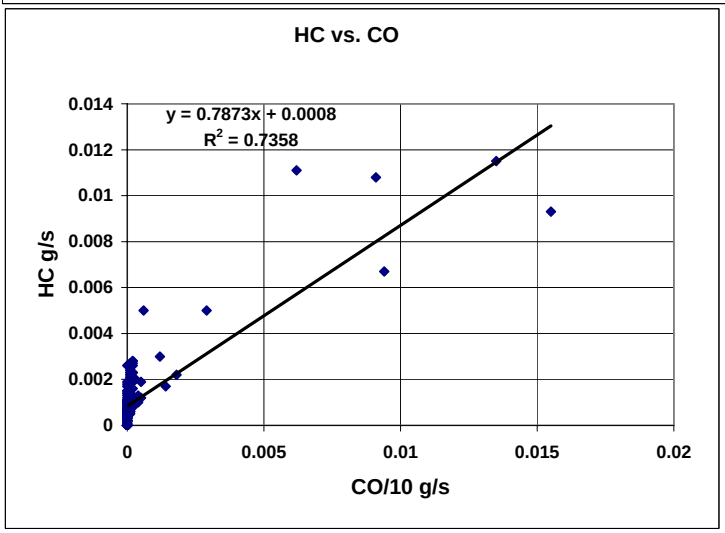


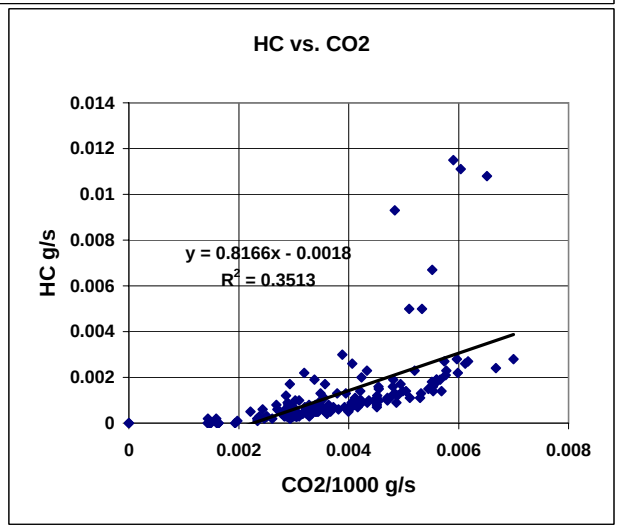
Ref:	**25**					**Leak predicted:**	**No**
Cert:	**2908430**	**VIN:**	**1G6EL13B3NU611305**	**Make:**	**CADI**		
Year:	**1992**	**Model:**	**ELDORA**		**HC g/mi:**	**0.19**	
		HCLP:	**No**		**CO g/mi:**	**0.61**	
		Note:	**0**				

Avg HC when CO2 low g/s:		**0.000**	**Stdev %:**	**188%**	**Avg HC-HC$_{CO_2}$**	**0.001**		
HC vs. CO:	**A:**	**0.79**	**B:**	**0.001**	**R^2:**	**0.74**	**Stdev HC-HC$_{CO_2}$**	**0.001**
HC vs. CO2	**A:**	**0.82**	**B:**	**(0.002)**	**R^2:**	**0.35**	**Stdev HC-HC$_{CO_2}$**	**0.001**



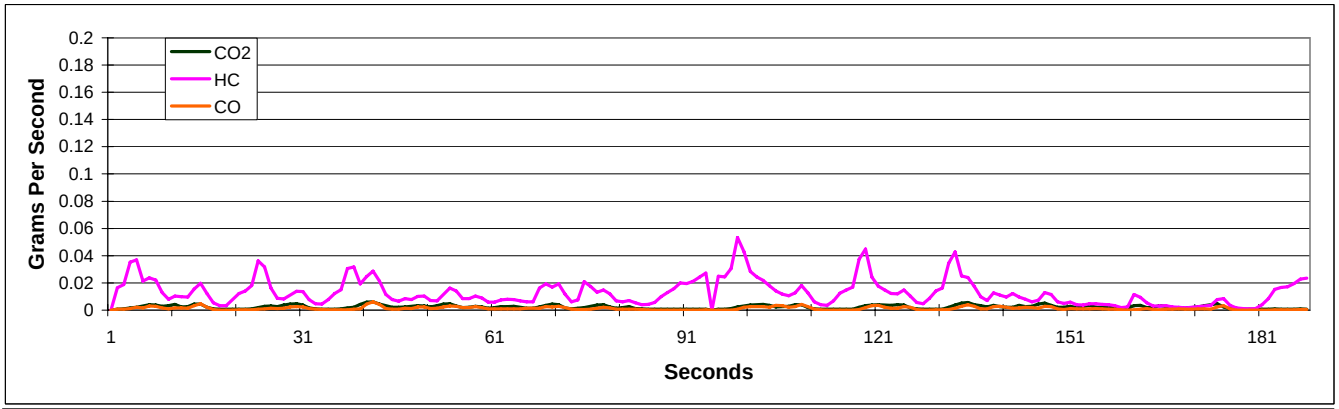


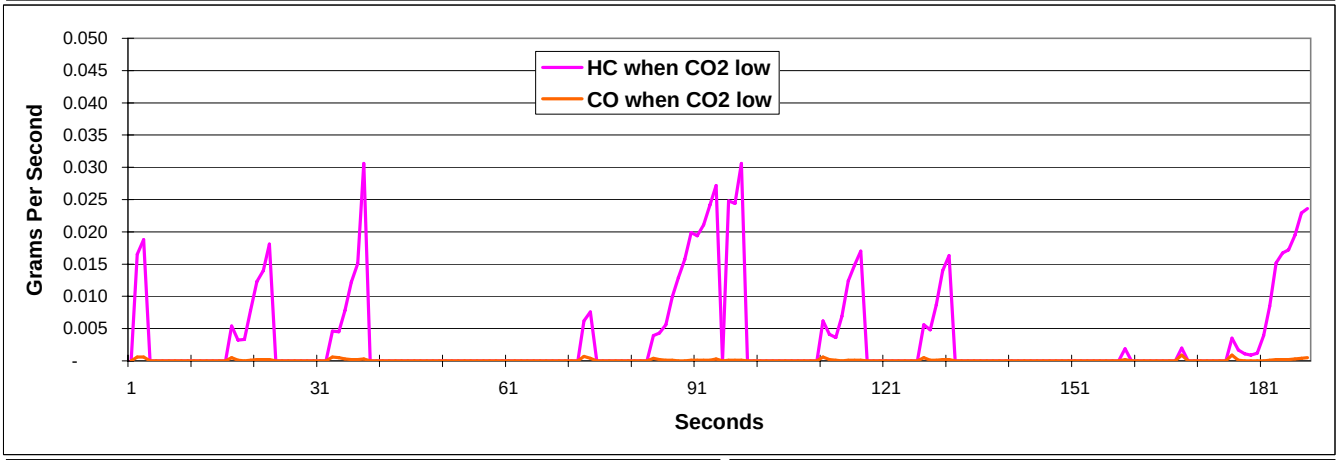


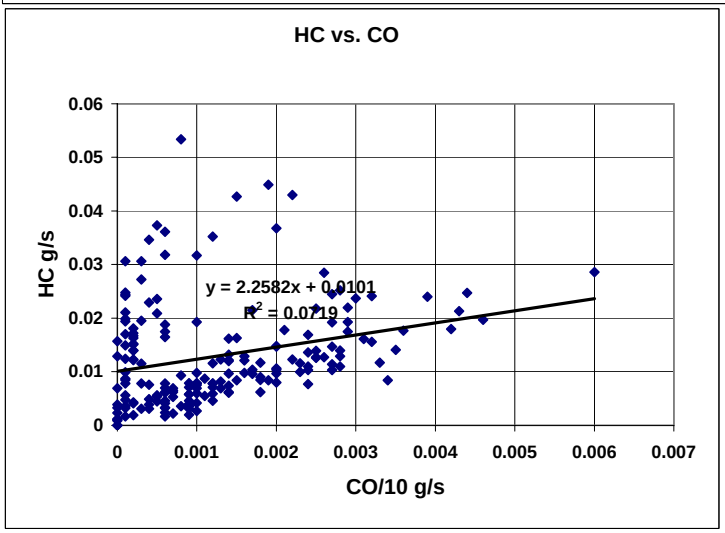


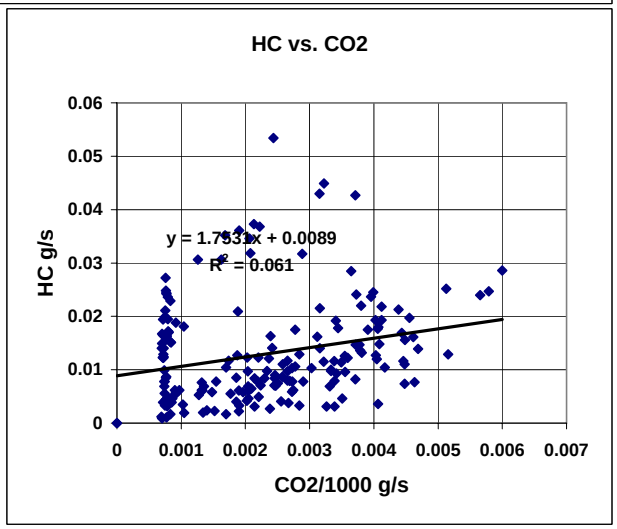
Ref: 26				**Leak predicted:**	Yes
Cert: 3033691	**VIN:** 1P3XA4639PF602679		**Make:** PLYM		
Year: 1993	**Model:** ACCLAI			**HC g/mi:**	2.18
	HCLP: Yes			**CO g/mi:**	2.12
	Note: small response at gas cap				

Avg HC when CO2 low g/s:	0.011	**Stdev %:**	73%	**Avg HC-$HC_{CO:}$**	0.010		
HC vs. CO:	**A:** 2.26	**B:**	0.010	**R^2:**	0.07	**Stdev HC-$HC_{CO:}$**	0.009
HC vs. CO2	**A:** 1.75	**B:**	0.009	**R^2:**	0.06	**Stdev HC-$HC_{CO2:}$**	0.009



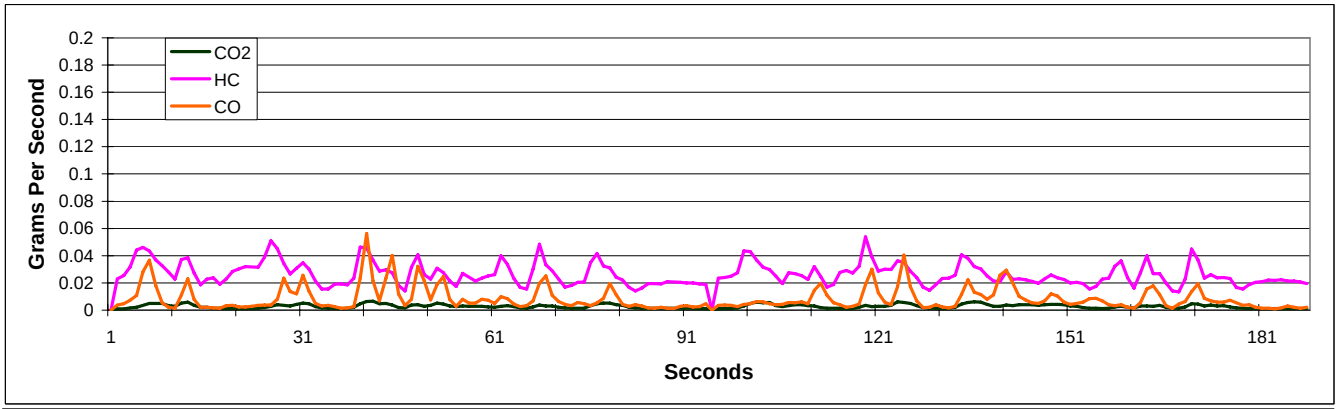


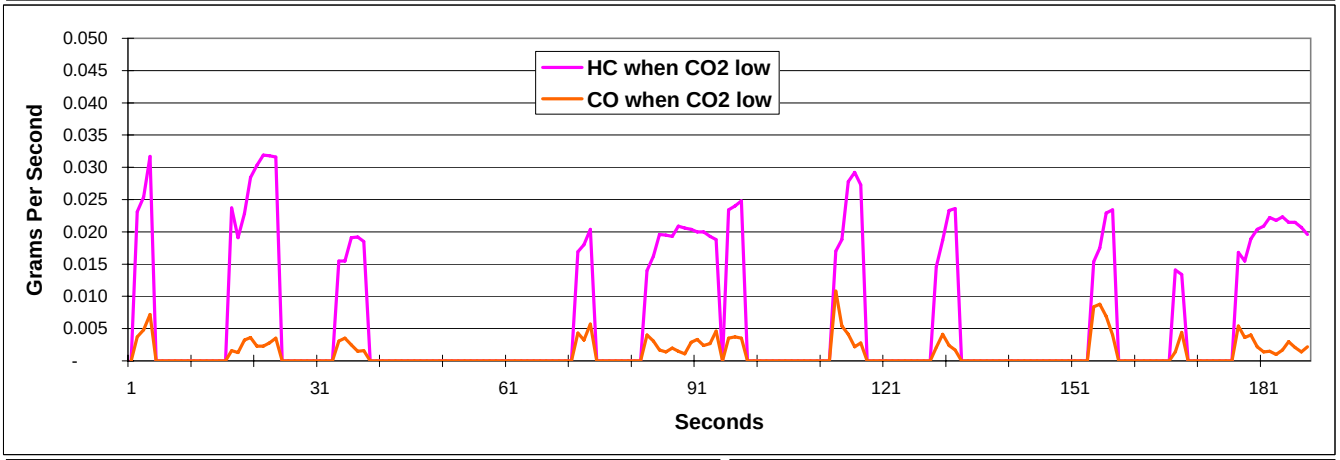


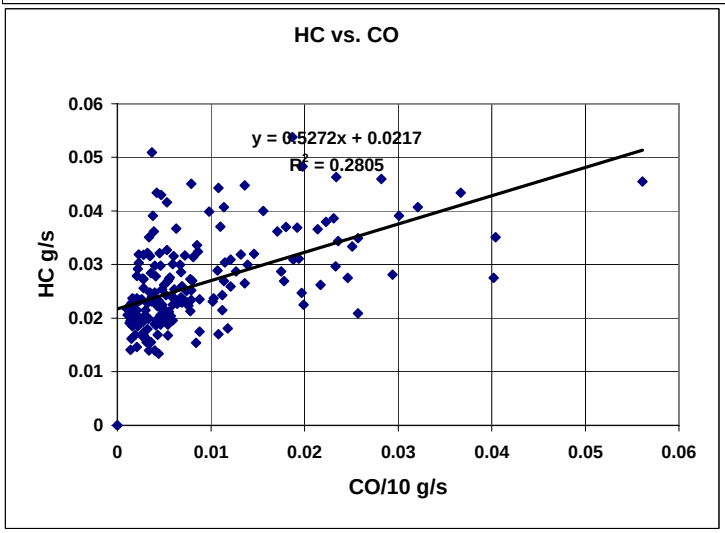


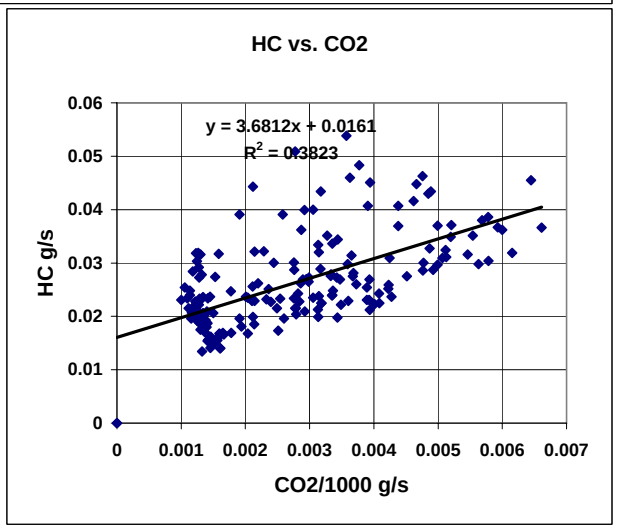
Ref: 27				Leak predicted:	Yes
Cert: 2922333	VIN: 1G1BN53E4NW134067		Make: CHEV		
Year: 1992	Model: CAPRIC		HC g/mi:	4.34	
	HCLP: No		CO g/mi:	14.05	
	Note: 0				

Avg HC when CO2 low g/s:	0.021	Stdev %:	26%	Avg HC-HC_{CO_2}:	0.022		
HC vs. CO:	A:	0.53	B:	0.022	R^2:	0.28	Stdev HC-HC_{CO_2}:	0.007
HC vs. CO2	A:	3.68	B:	0.016	R^2:	0.38	Stdev HC-HC_{CO_2}:	0.007



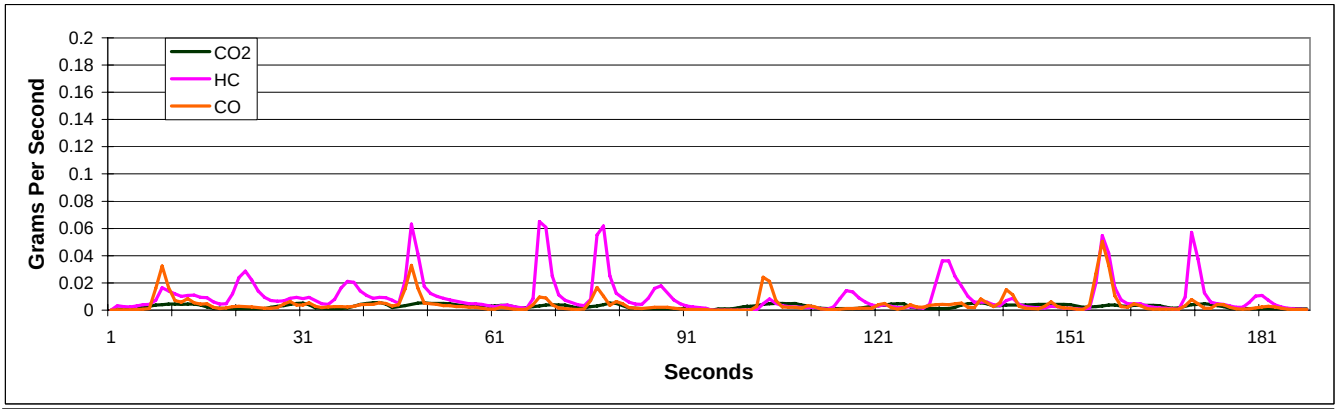


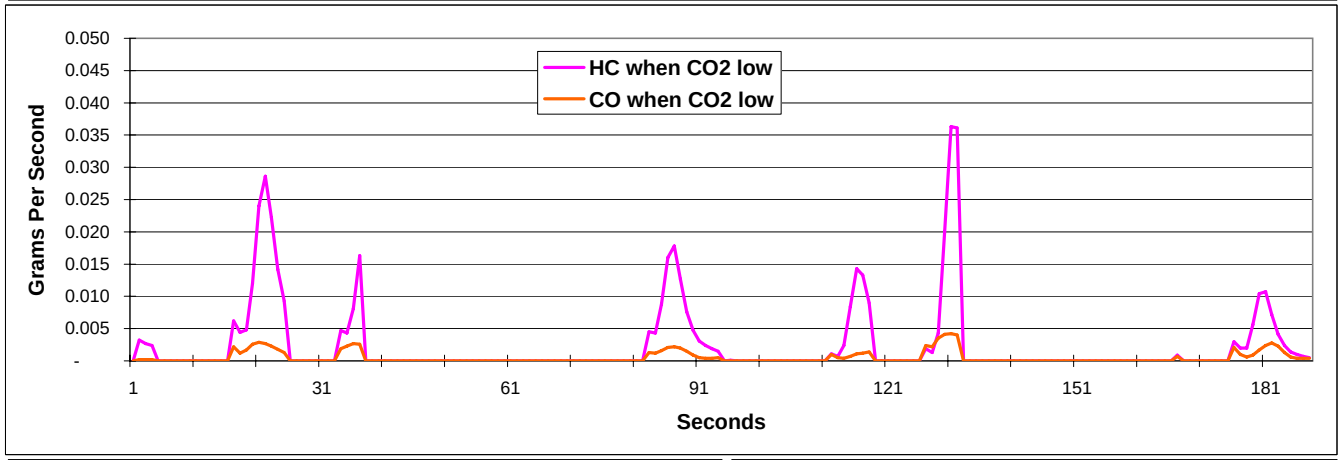


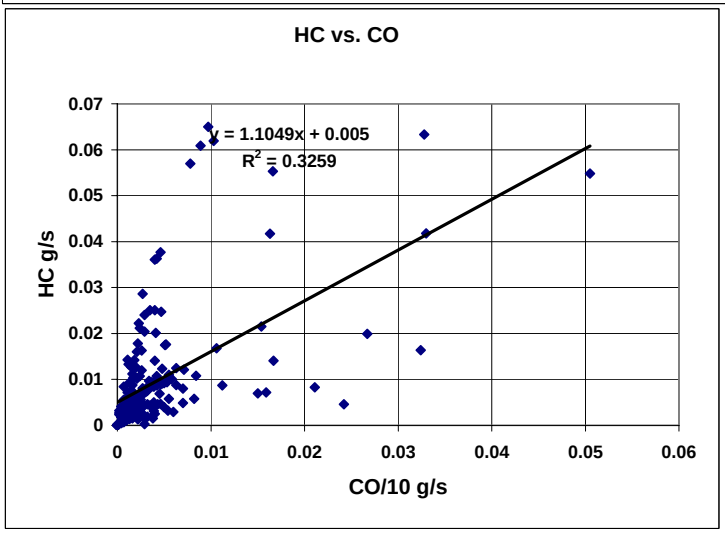


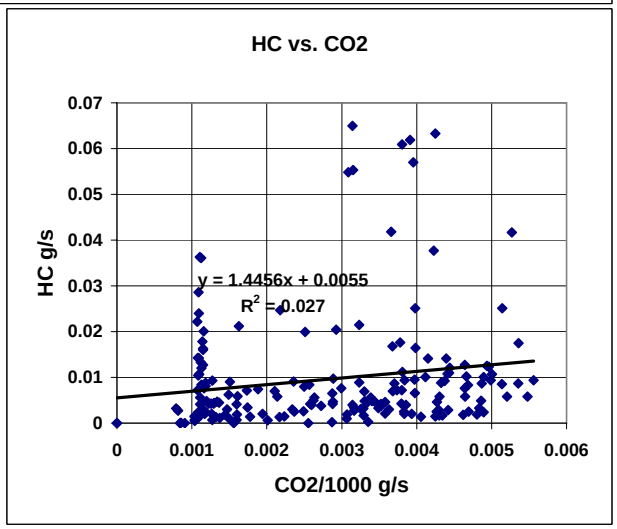
Ref: 28				**Leak predicted:**	No
Cert: 2620603	**VIN:** 2C3HD56F9SH602205		**Make:** CHRY		
Year: 1995	**Model:** CONCOR			**HC g/mi:**	1.68
	HCLP: Yes			**CO g/mi:**	7.26
	Note: small response at RS intake manifold - no odor				

Avg HC when CO2 low g/s:		0.008	**Stdev %:**	110%	**Avg HC-$HC_{CO:}$**	0.005	
HC vs. CO:	**A:**	1.10	**B:**	0.005	**R^2:**	0.33	**Stdev HC-$HC_{CO:}$** 0.010
HC vs. CO2	**A:**	1.45	**B:**	0.006	**R^2:**	0.03	**Stdev HC-$HC_{CO2:}$** 0.012



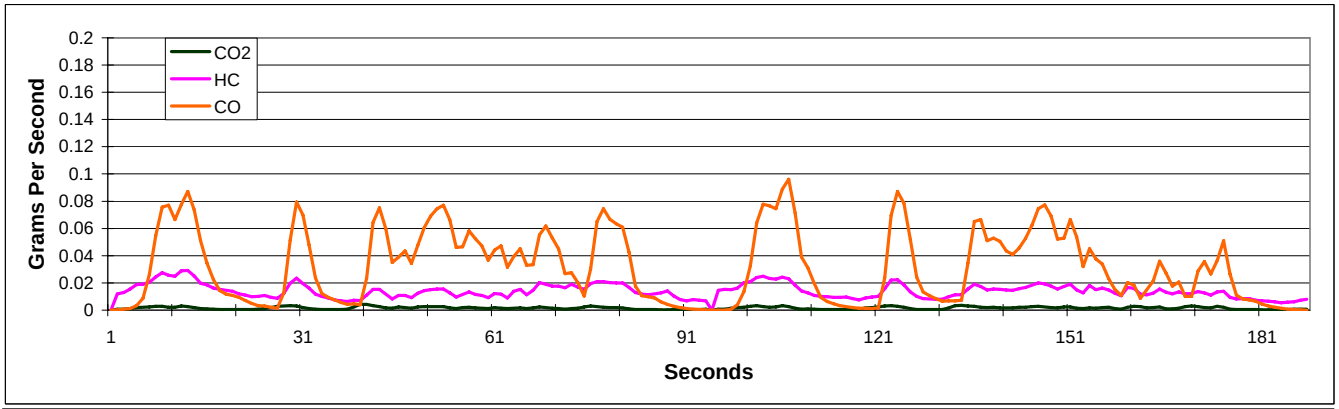


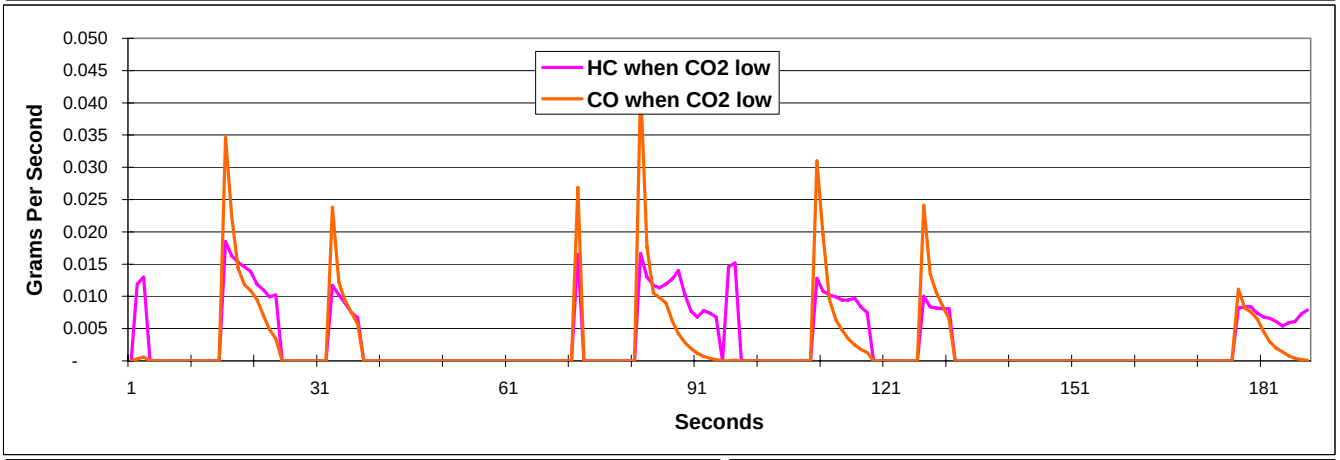


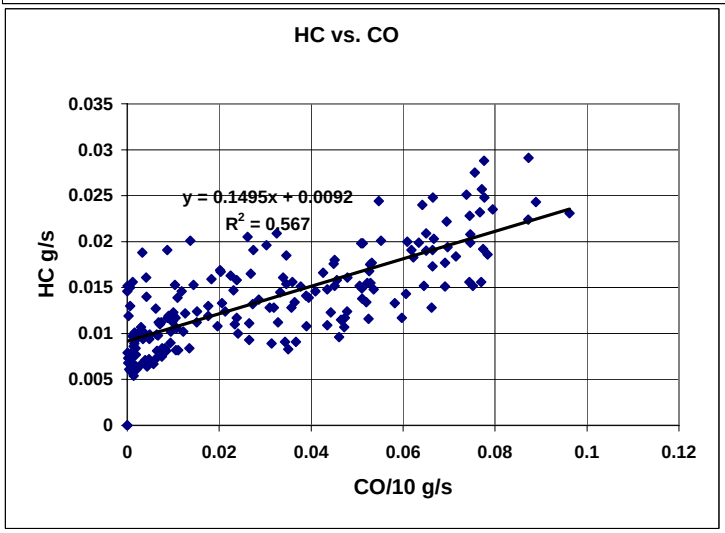


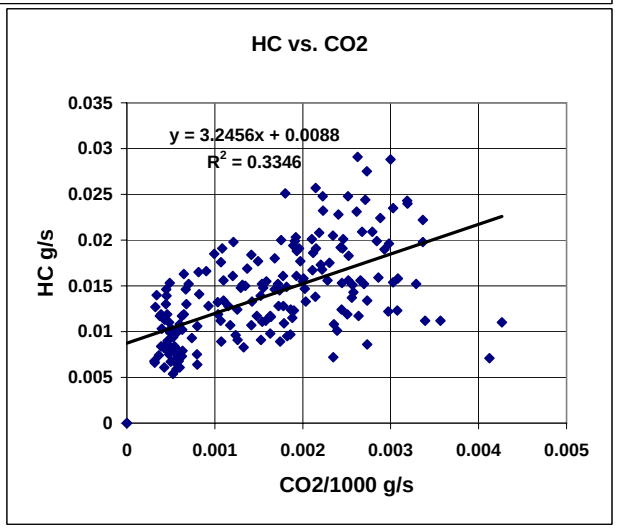
Ref: 29					**Leak predicted:** No
Cert: 2939255	**VIN:** 1FAPP11J9PW334595		**Make:** FORD		
Year: 1993	**Model:** ESCORT			**HC g/mi:**	2.35
	HCLP: Yes			**CO g/mi:**	53.44
	Note: response at tank fill - behind neck trim				

Avg HC when CO2 low g/s:		0.010	**Stdev %:**	35%	**Avg HC-$HC_{CO:}$**	0.009	
HC vs. CO:	**A:**	0.15	**B:**	0.009	**R^2:**	0.57	**Stdev HC-$HC_{CO:}$** 0.003
HC vs. CO2	**A:**	3.25	**B:**	0.009	**R^2:**	0.33	**Stdev HC-$HC_{CO2:}$** 0.004



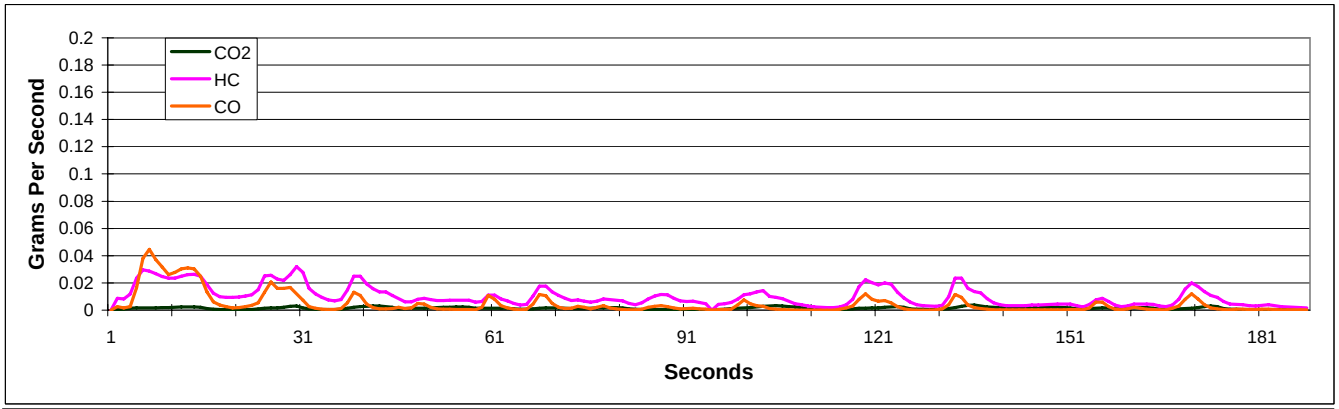


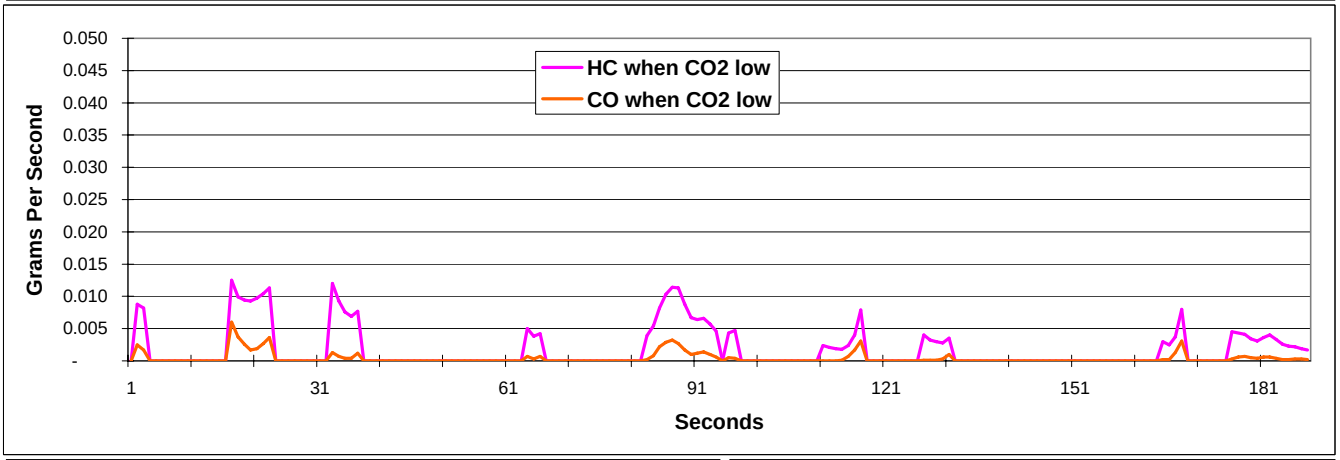


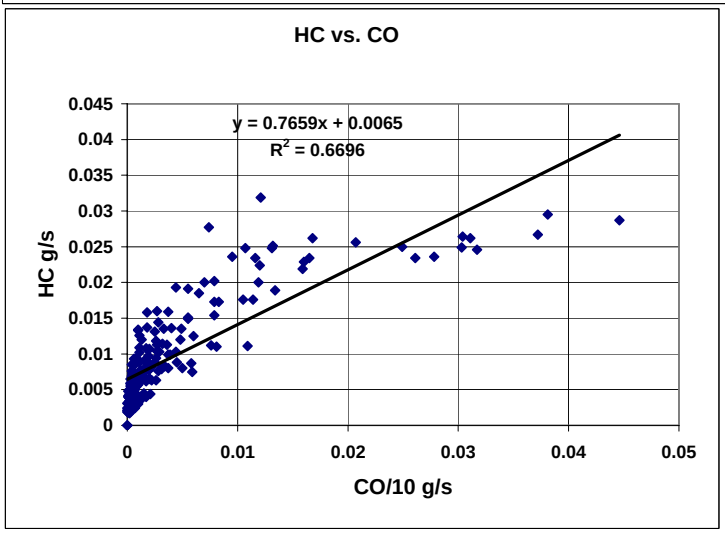


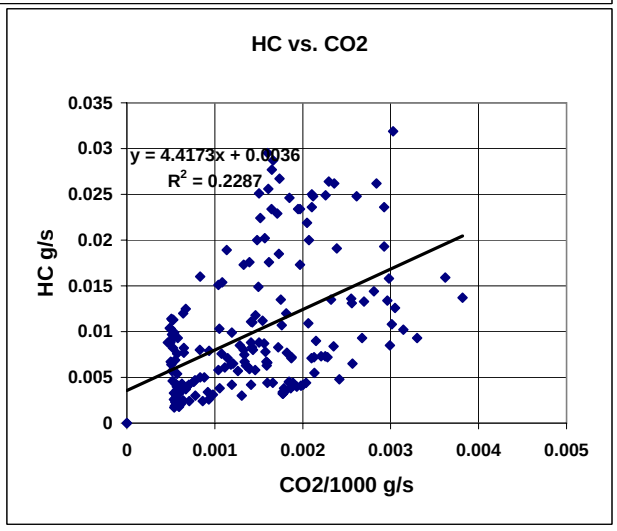
Ref: 31				Leak predicted:	No
Cert: 2911453	VIN: 1HGED3643ML056624		Make: HOND		
Year: 1991	Model: CIVIC			HC g/mi:	1.65
	HCLP: No			CO g/mi:	7.46
	Note: 0				

Avg HC when CO2 low g/s:	0.006	Stdev %:	58%	Avg HC-$HC_{CO:}$	0.006		
HC vs. CO:	A:	0.77	B:	0.006	R^2:	0.67	Stdev HC-$HC_{CO:}$ 0.004
HC vs. CO2	A:	4.42	B:	0.004	R^2:	0.23	Stdev HC-$HC_{CO2:}$ 0.006



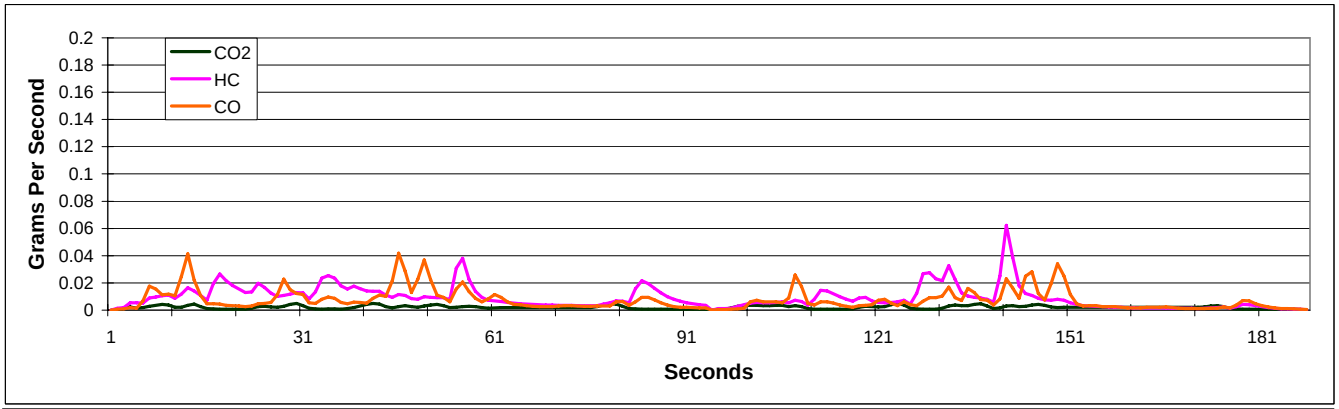


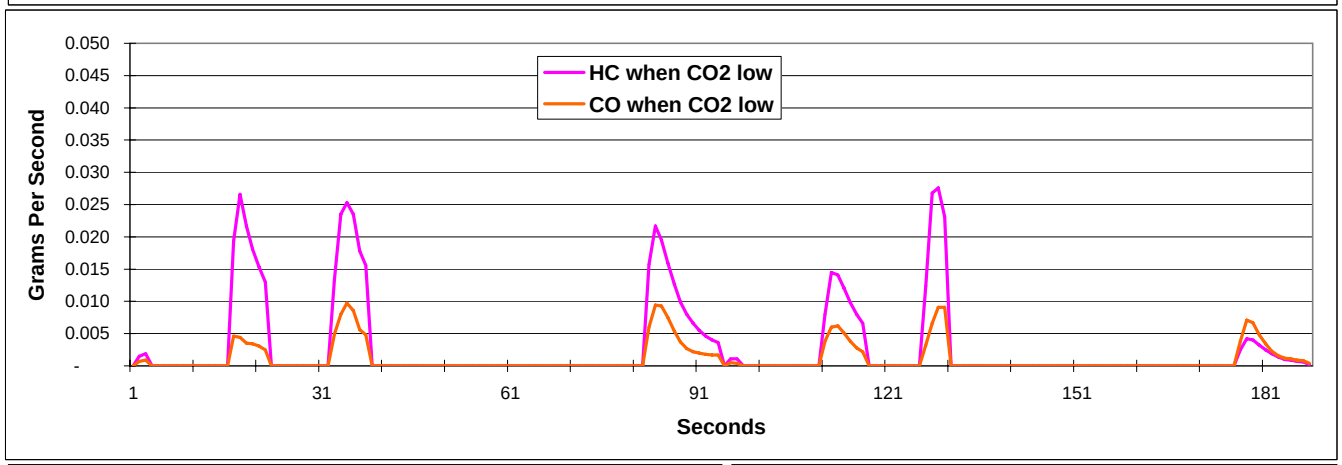


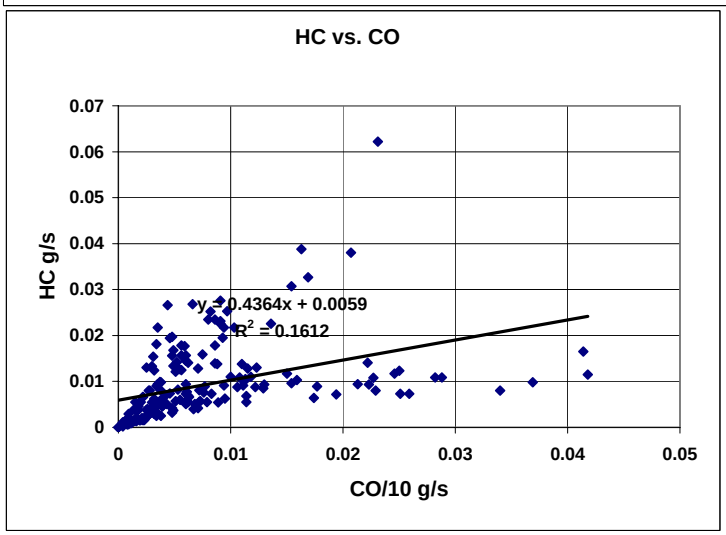


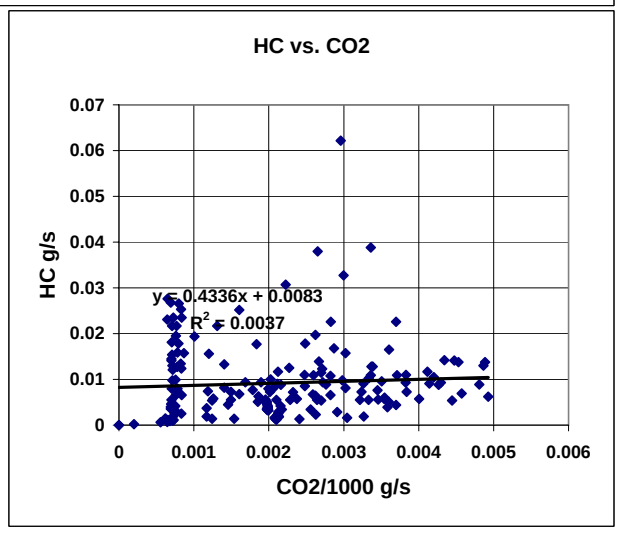
Ref: 32				**Leak predicted:**	Yes
Cert: 2906692	**VIN:** 1ZVLT20A2S5139722		**Make:** FORD		
Year: 1995	**Model:** PROBE			**HC g/mi:**	1.51
	HCLP: No			**CO g/mi:**	12.41
	Note: 0				

Avg HC when CO2 low g/s:	0.011	**Stdev %:**	78%	**Avg HC-HC_{CO_2}:**	0.006		
HC vs. CO:	**A:** 0.44	**B:**	0.006	**R^2:**	0.16	**Stdev HC-HC_{CO_2}:**	0.008
HC vs. CO2	**A:** 0.43	**B:**	0.008	**R^2:**	0.00	**Stdev HC-HC_{CO_2}:**	0.008



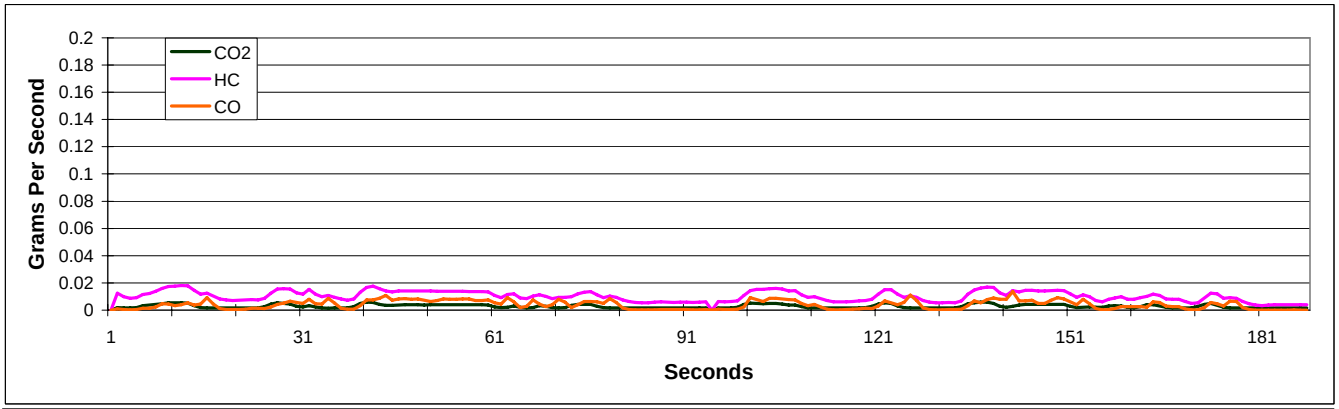


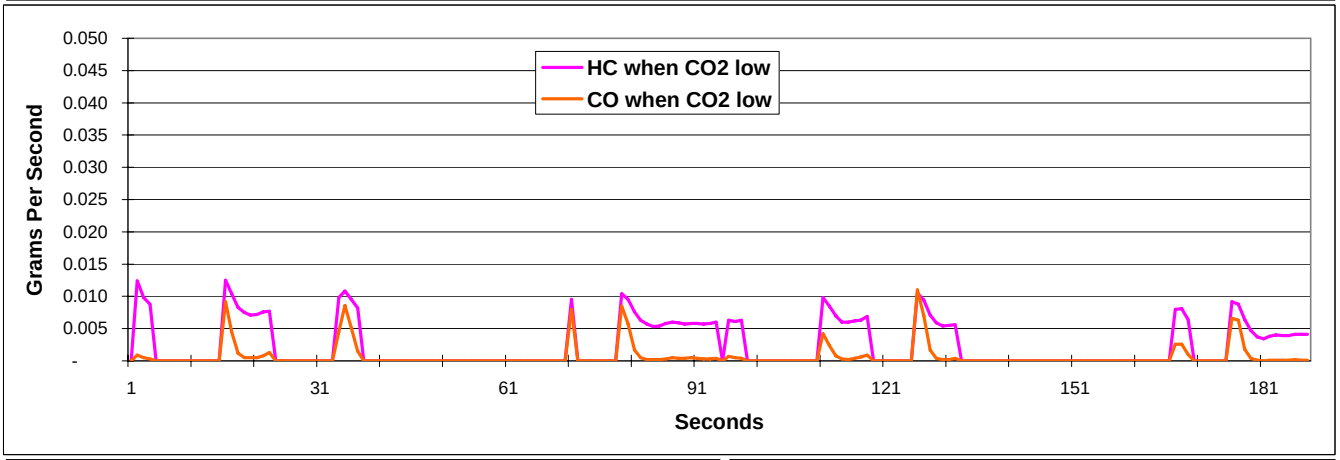


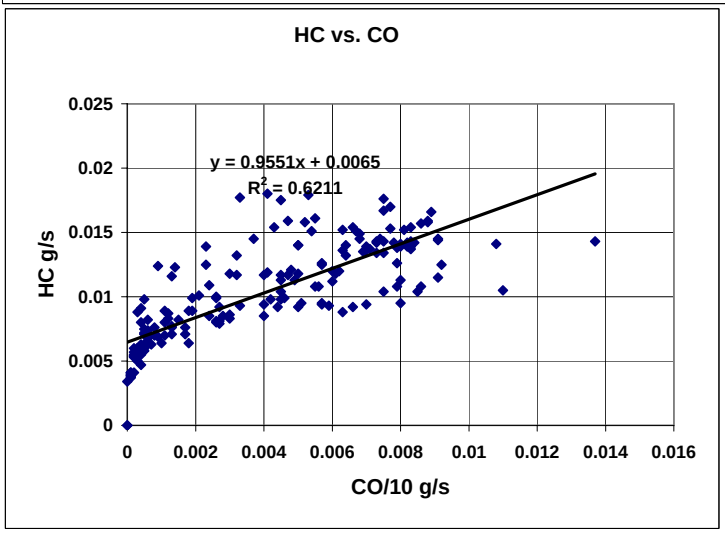


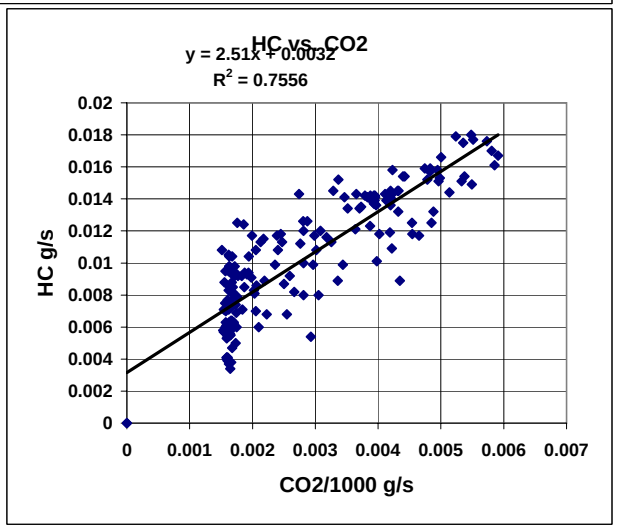
Ref: 33				**Leak predicted:**	No
Cert: 2917502	**VIN:** 1G6DW51Y2H9754934		**Make:** CADI		
Year: 1987	**Model:** BROUGH			**HC g/mi:**	1.69
	HCLP: No			**CO g/mi:**	6.51
	Note: 0				

Avg HC when CO2 low g/s:		**0.007**	**Stdev %:**	**33%**	**Avg HC-$HC_{CO:}$**	**0.006**	
HC vs. CO:	**A:**	**0.96**	**B:**	**0.006**	**R^2:**	**0.62**	**Stdev HC-$HC_{CO:}$** **0.002**
HC vs. CO2	**A:**	**2.51**	**B:**	**0.003**	**R^2:**	**0.76**	**Stdev HC-$HC_{CO2:}$** **0.002**



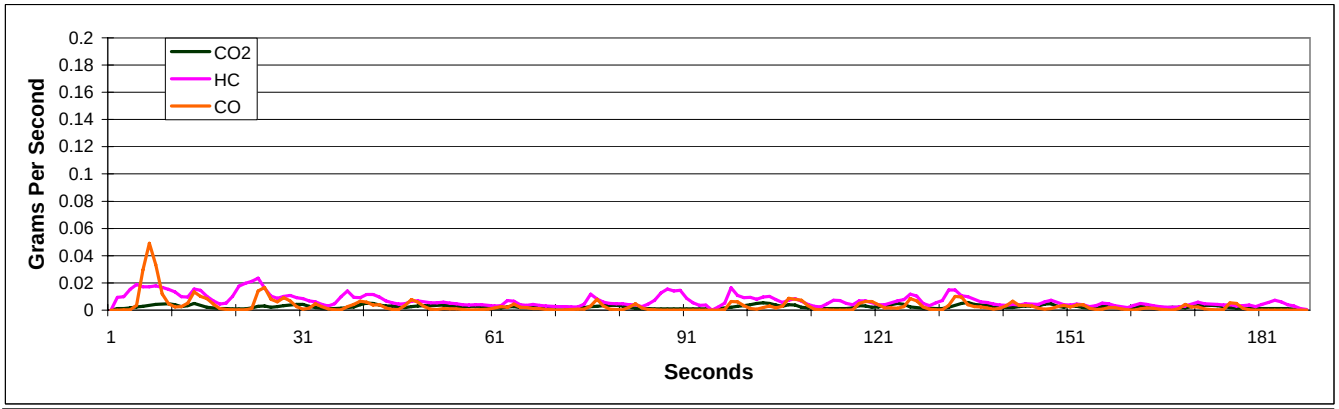


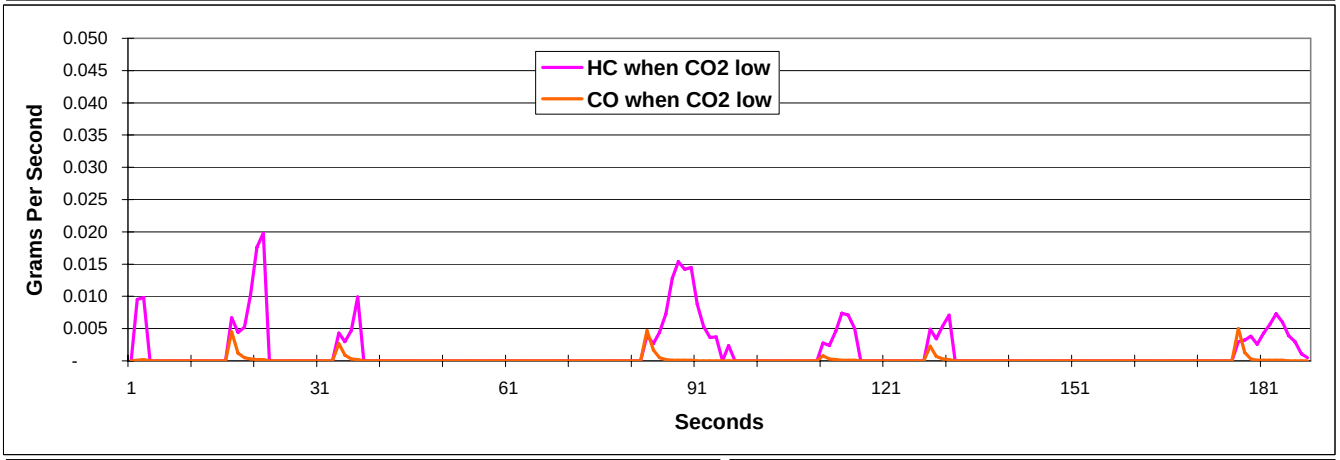


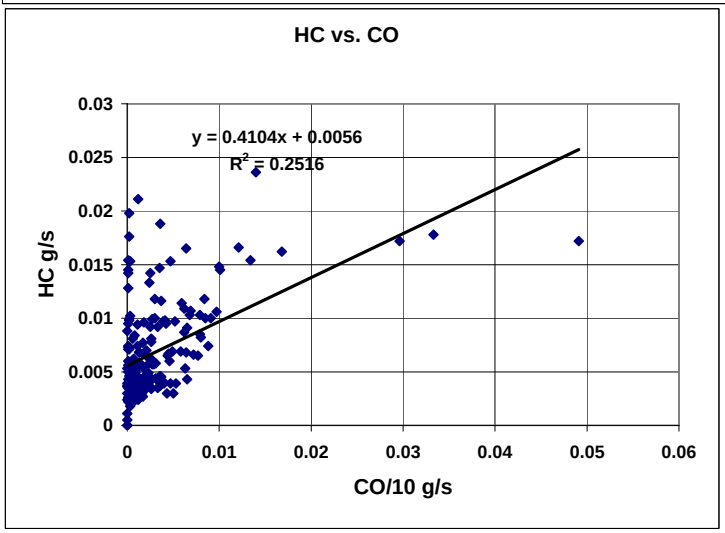


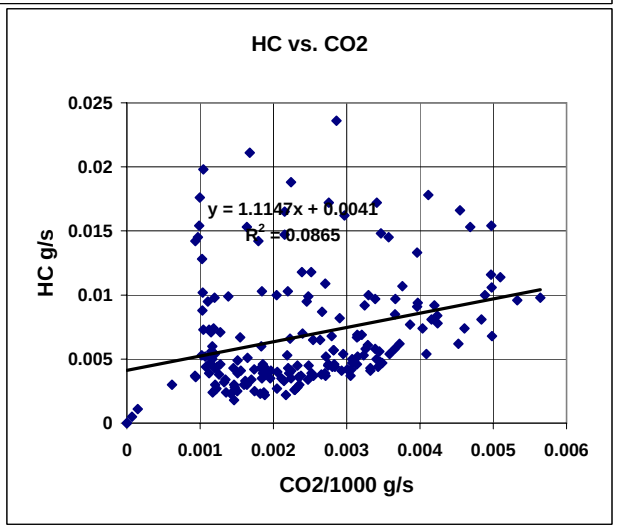
Ref: 34				**Leak predicted:**	No
Cert: 2910672	**VIN:** 1G3WS54T4MD329904		**Make:** OLDS		
Year: 1991	**Model:** CUTLAS			**HC g/mi:**	1.10
	HCLP: No			**CO g/mi:**	4.93
	Note: 0				

Avg HC when CO2 low g/s:	0.006	**Stdev %:**	73%	**Avg HC-$HC_{CO:}$**	0.006		
HC vs. CO:	**A:** 0.41	**B:**	0.006	**R^2:**	0.25	**Stdev HC-$HC_{CO:}$**	0.004
HC vs. CO2	**A:** 1.11	**B:**	0.004	**R^2:**	0.09	**Stdev HC-$HC_{CO2:}$**	0.004



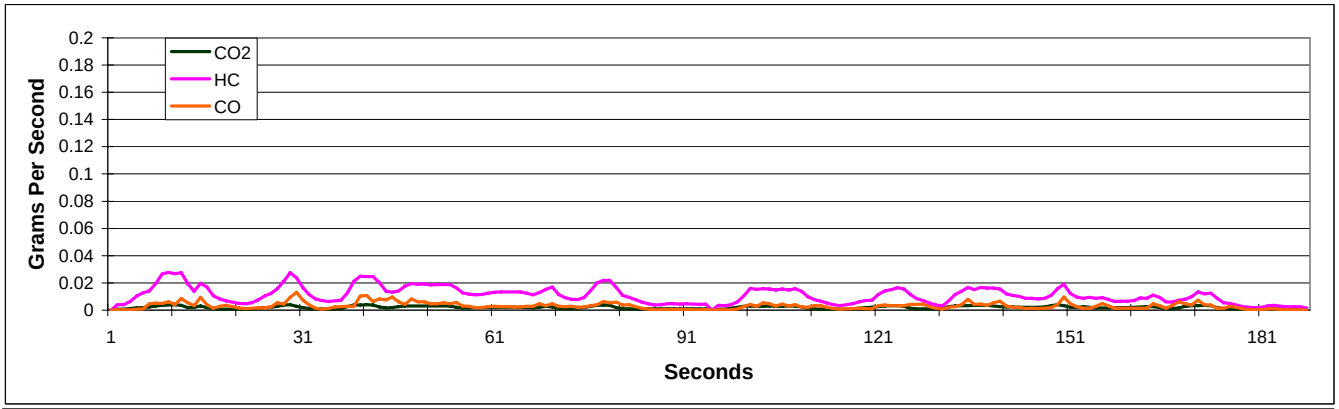


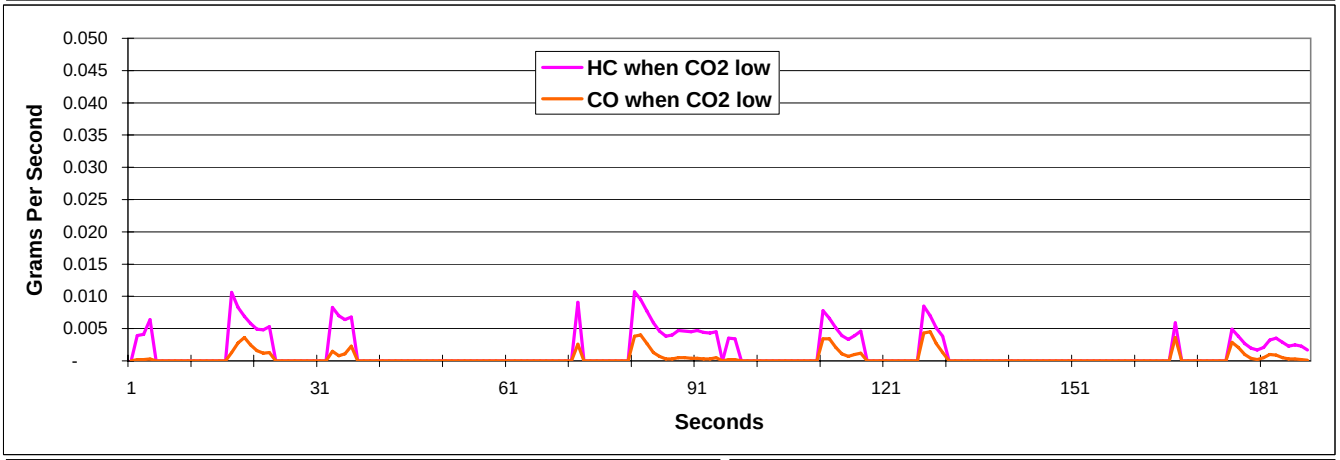


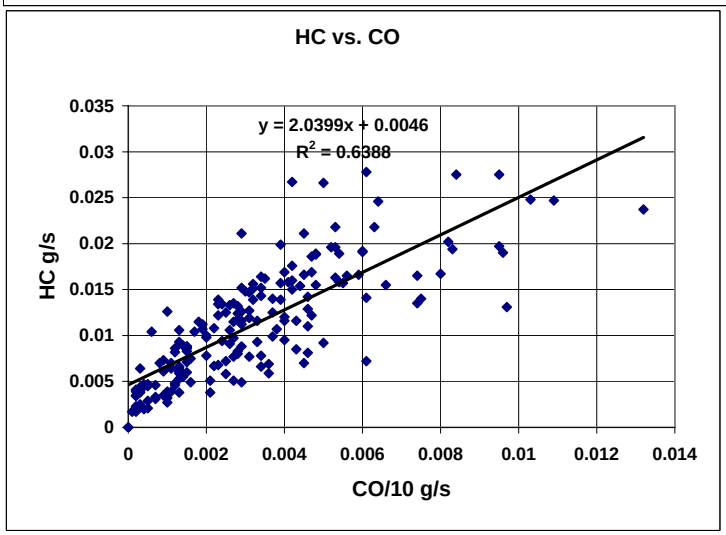


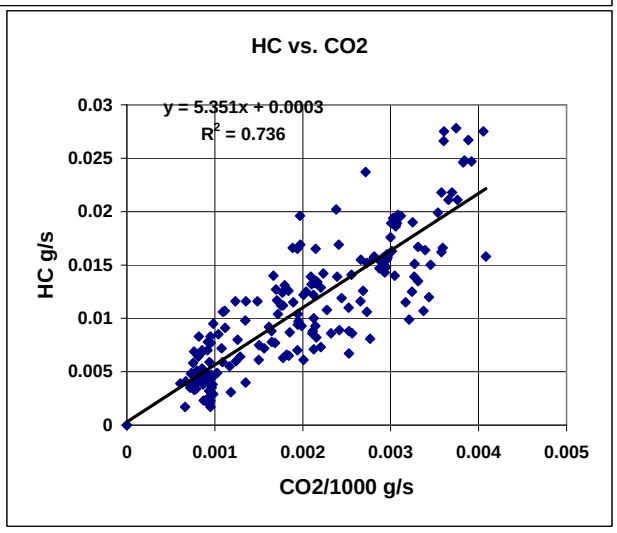
Ref: 35				Leak predicted:	No
Cert: 3028047	VIN: 1N4BU31D4RC116898		Make: NISS		
Year: 1994	Model: ALTIMA			HC g/mi:	1.84
	HCLP: Yes			CO g/mi:	5.23
	Note: gas cap neck				

Avg HC when CO2 low g/s:	0.005	Stdev %:	47%	Avg HC-$HC_{CO:}$	0.005		
HC vs. CO:	A:	2.04	B:	0.005	R^2:	0.64	Stdev HC-$HC_{CO:}$ 0.004
HC vs. CO2	A:	5.35	B:	0.000	R^2:	0.74	Stdev HC-$HC_{CO2:}$ 0.003



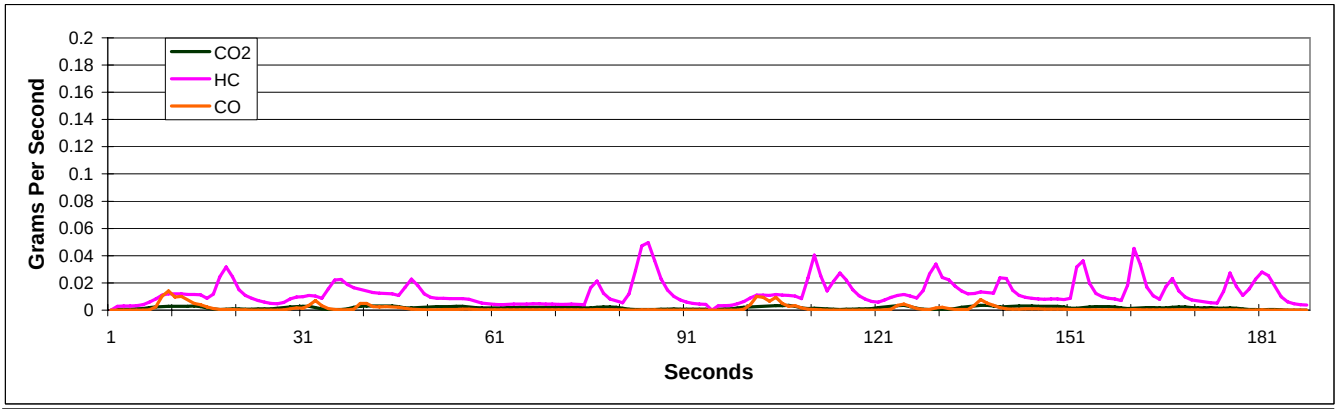


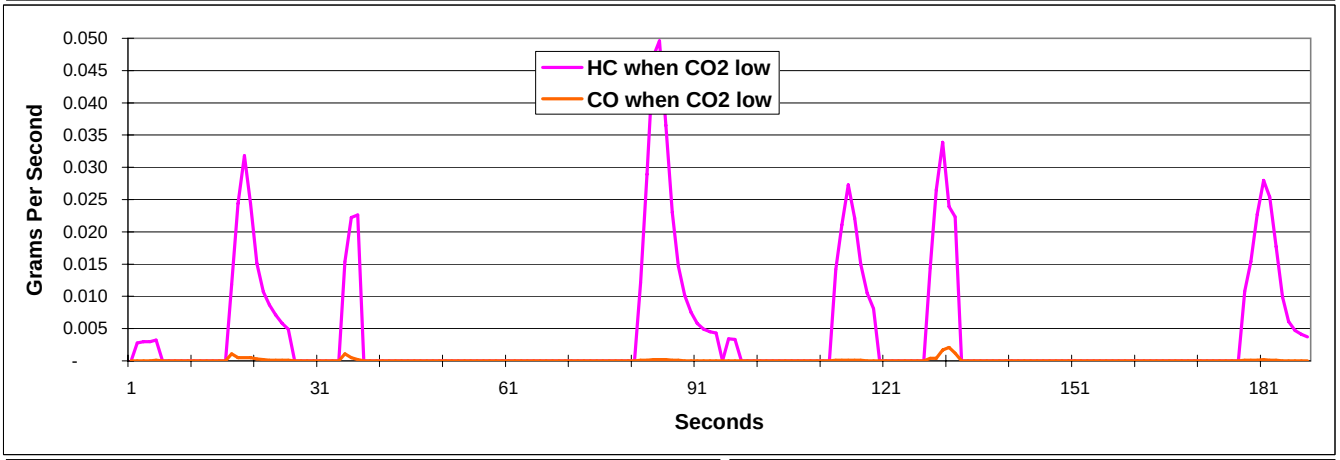


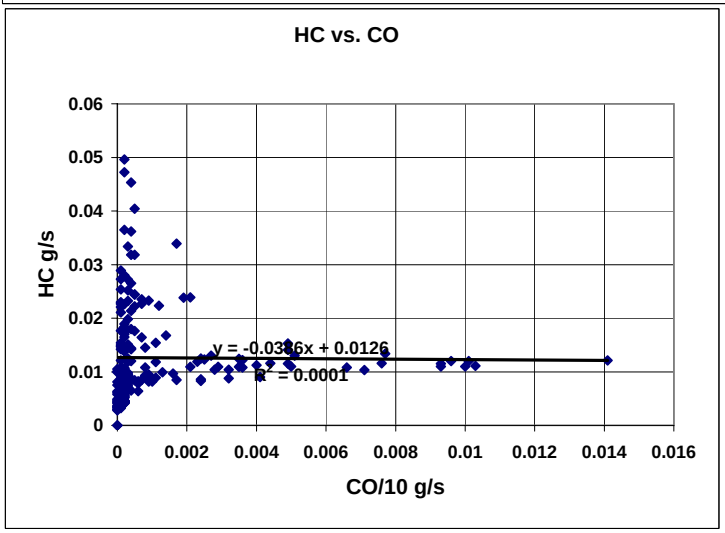


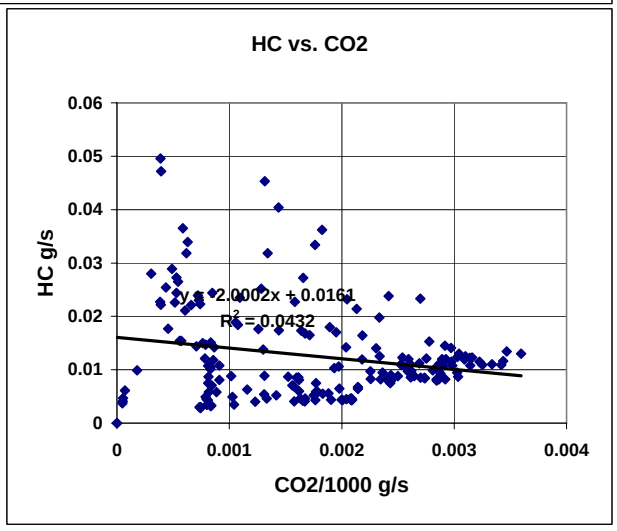
Ref: 36				**Leak predicted:** Yes	
Cert: 3002964	**VIN:** 1HGCA626XKA033097		**Make:** HOND		
Year: 1989	**Model:** ACCORD			**HC g/mi:**	2.12
	HCLP: Yes			**CO g/mi:**	2.12
	Note: tank fill tube to hose - wet				

Avg HC when CO2 low g/s:	0.016	**Stdev %:**	69%	**Avg HC-$HC_{CO:}$**	0.013		
HC vs. CO:	**A:** (0.04)	**B:**	0.013	**R^2:**	0.00	**Stdev HC-$HC_{CO:}$**	0.009
HC vs. CO2	**A:** (2.00)	**B:**	0.016	**R^2:**	0.04	**Stdev HC-$HC_{CO2:}$**	0.009



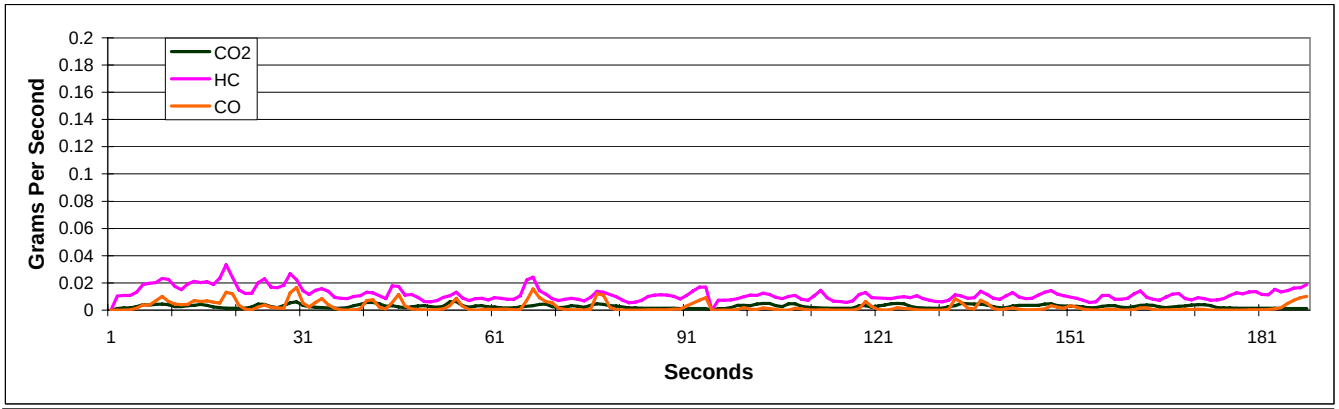


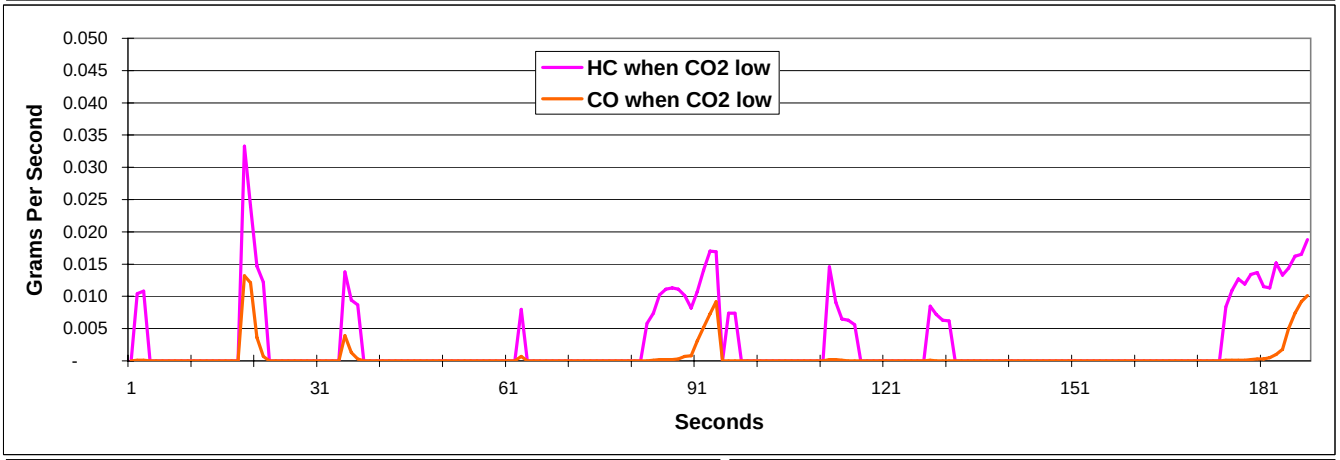


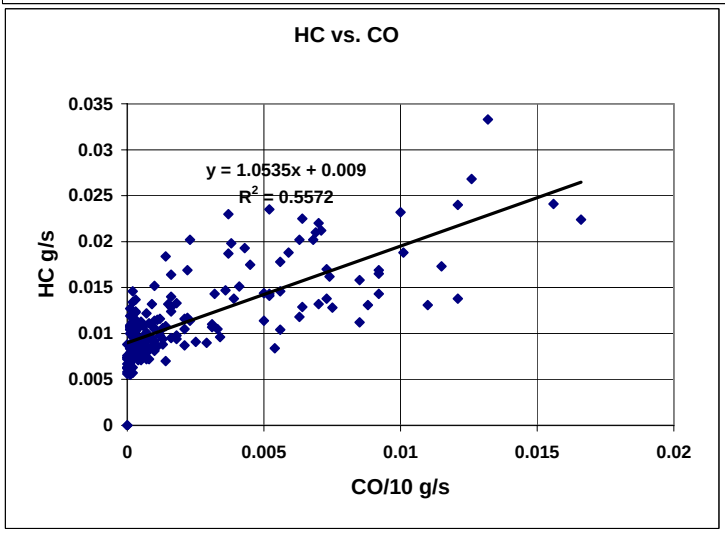


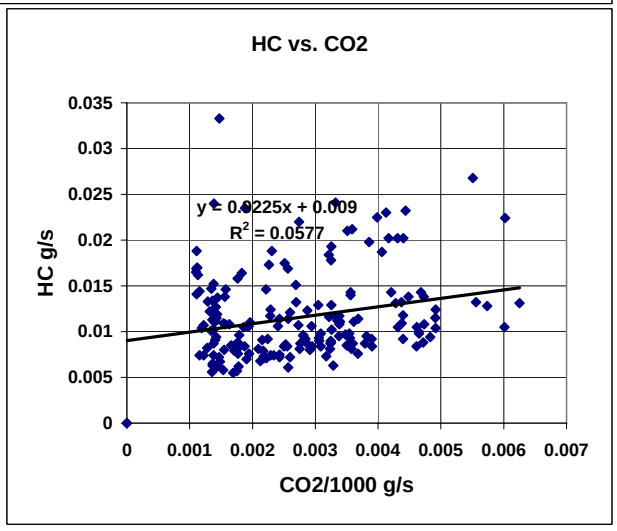
Ref: 37				**Leak predicted:**	Yes
Cert: 2916569	**VIN:** 2G1FP22P0P2114626		**Make:** CHEV		
Year: 1993	**Model:** CAMARO			**HC g/mi:**	1.92
	HCLP: Yes			**CO g/mi:**	4.02
	Note: fuel fill neck / LS tank				

Avg HC when CO2 low g/s:	0.012	**Stdev %:**	47%	**Avg HC-HC$_{CO:}$**	0.009		
HC vs. CO:	**A:** 1.05	**B:**	0.009	**R^2:**	0.56	**Stdev HC-HC$_{CO:}$**	0.003
HC vs. CO2	**A:** 0.92	**B:**	0.009	**R^2:**	0.06	**Stdev HC-HC$_{CO2:}$**	0.005









Ref: 38 | Leak predicted: No

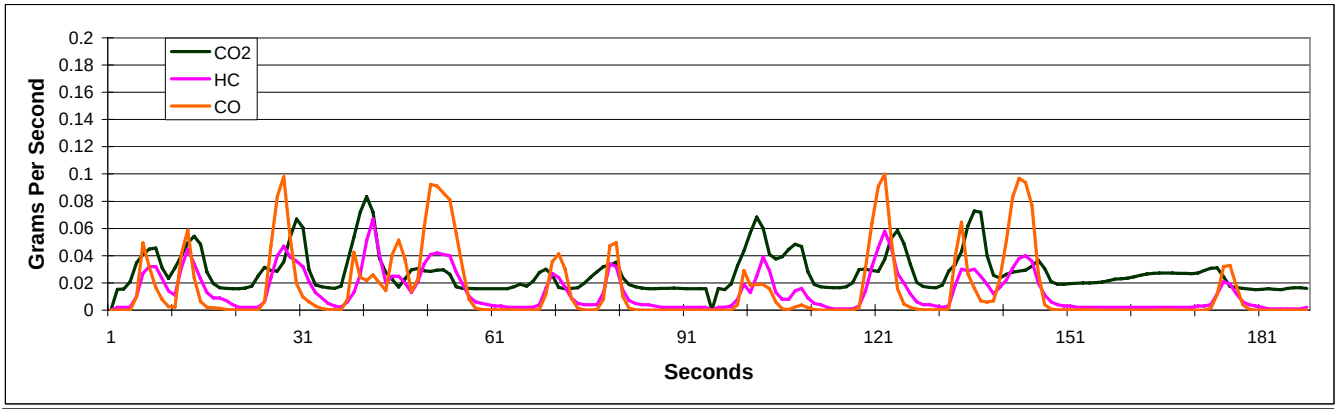
Cert: 3026785 | VIN: 1G6DW51Y5H9754779 | Make: CADI

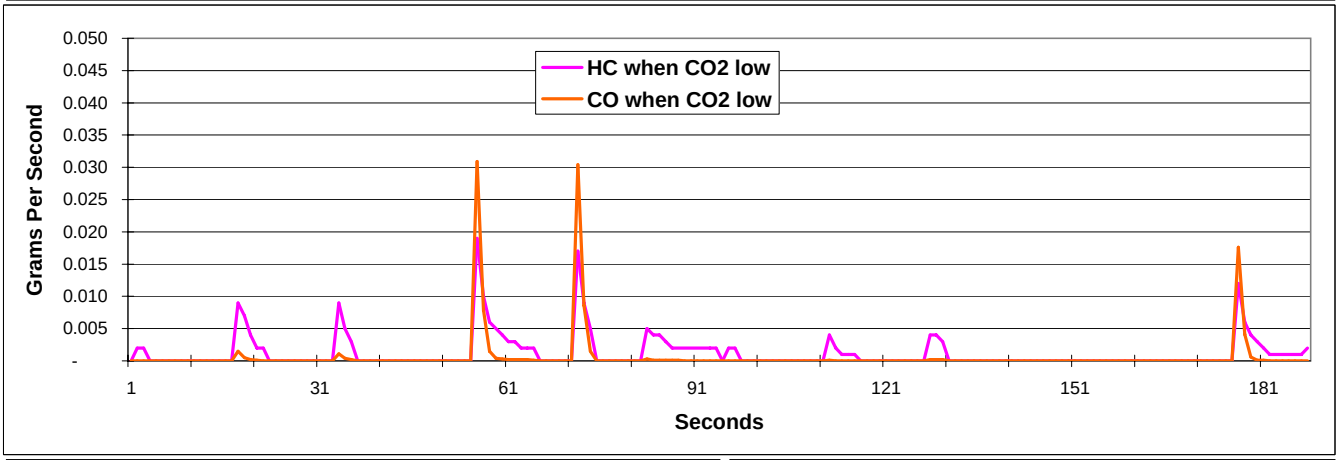
Year: 1987 | Model: DEVILL | HC g/mi: 2.21

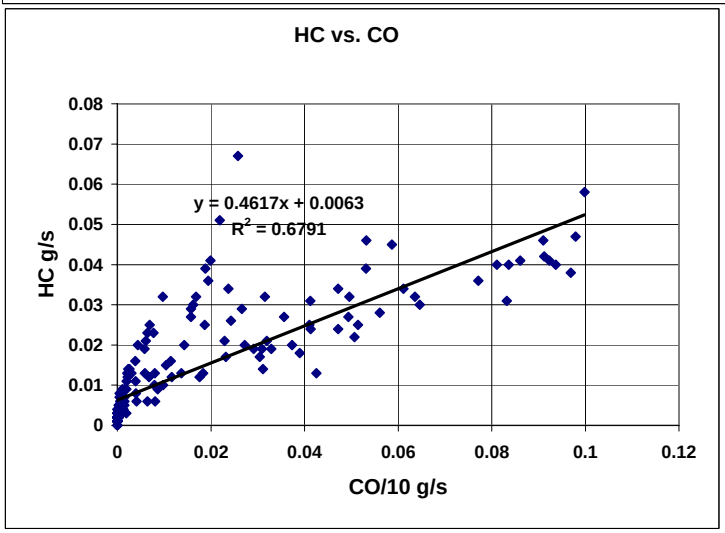
HCLP: 2x Yes | CO g/mi: 25.40

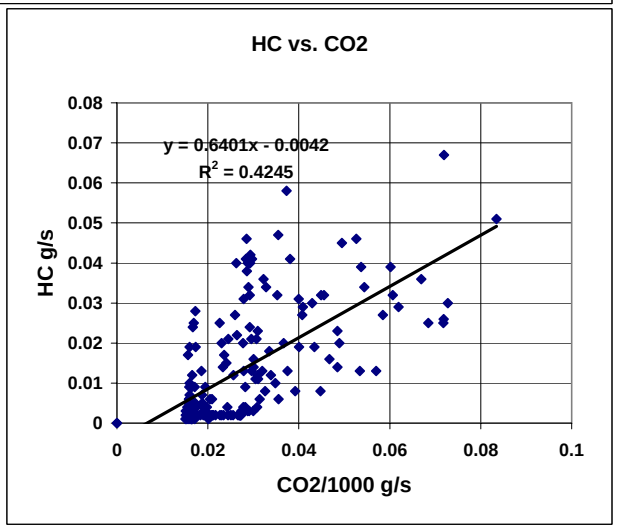
Note: gas cap (20-150) wrong cap? Replaced w/10817. at air cleaner (10-20)

Avg HC when CO2 low g/s:		0.004	Stdev %:	95%	Avg HC-$HC_{CO:}$	0.006		
HC vs. CO:	A:	0.46	B:	0.006	R^2:	0.68	Stdev HC-$HC_{CO:}$	0.008
HC vs. CO2	A:	0.64	B:	(0.004)	R^2:	0.42	Stdev HC-$HC_{CO2:}$	0.011



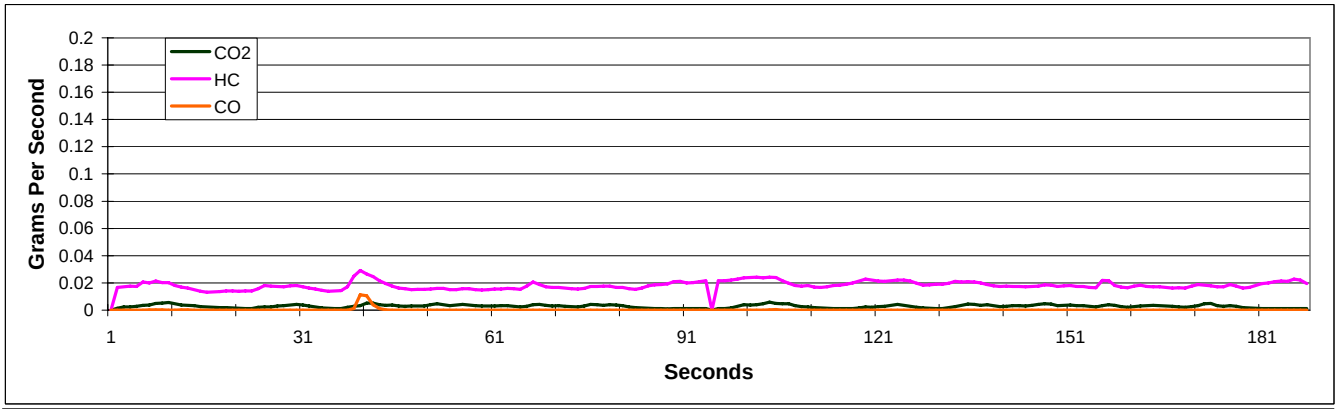


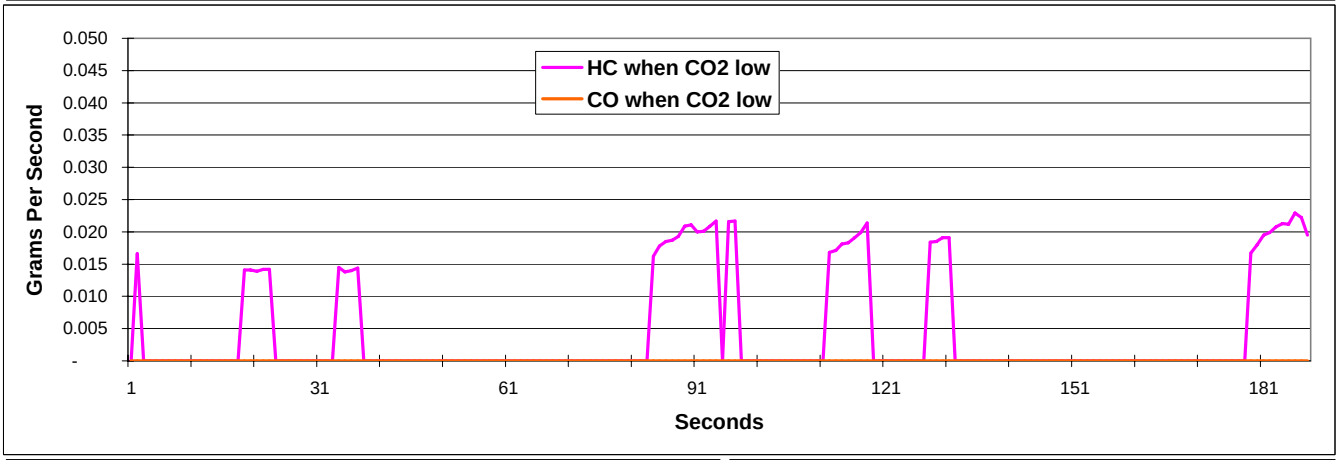


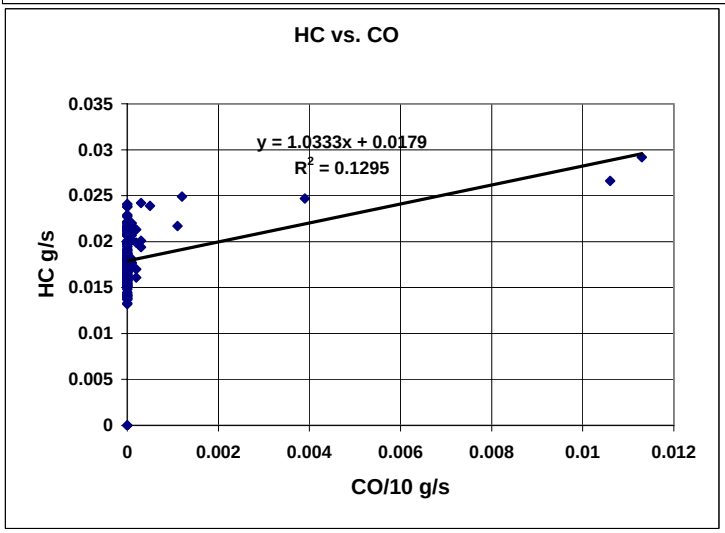


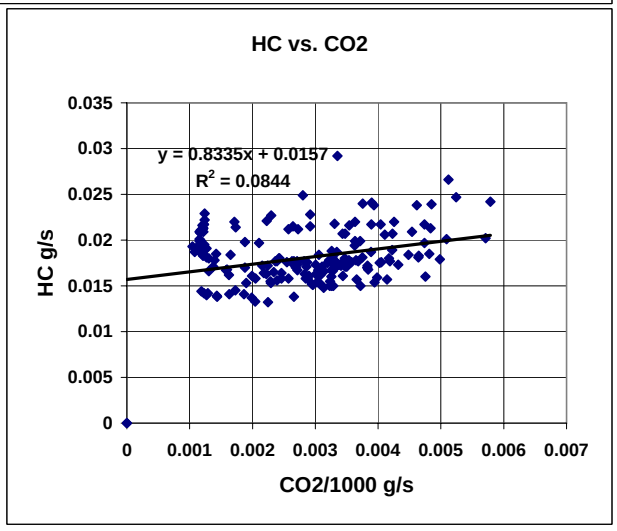
Ref:	**39**					**Leak predicted:**	**Yes**
Cert:	**3003593**	**VIN:**	**1FACP42E3MF179491**	**Make:**	**FORD**		
Year:	**1991**	**Model:**	**MUSTAN**		**HC g/mi:**	**2.99**	
		HCLP:	**Yes**		**CO g/mi:**	**0.27**	
		Note:	**tank line at canister disconnected. Reconnected = pass**				

Avg HC when CO2 low g/s:		**0.018**	**Stdev %:**	**21%**	**Avg HC-HC$_{CO_2}$:**	**0.018**			
HC vs. CO:	**A:**	**1.03**	**B:**	**0.018**	**R^2:**	**0.13**	**Stdev HC-HC$_{CO_2}$**	**0.003**	
HC vs. CO2	**A:**	**0.83**	**B:**	**0.016**	**R^2:**	**0.08**	**Stdev HC-HC$_{CO_2}$**	**0.003**	



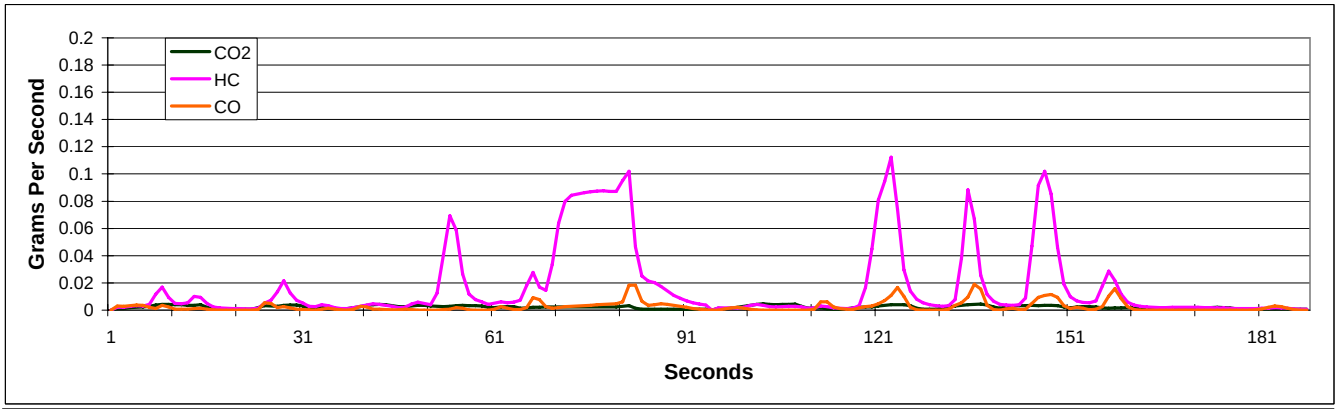


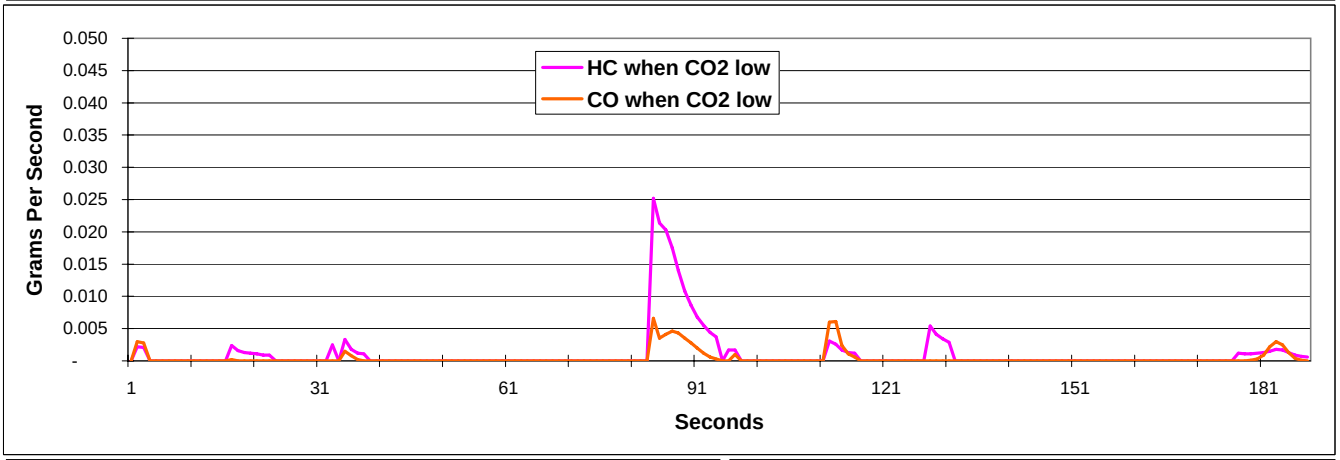


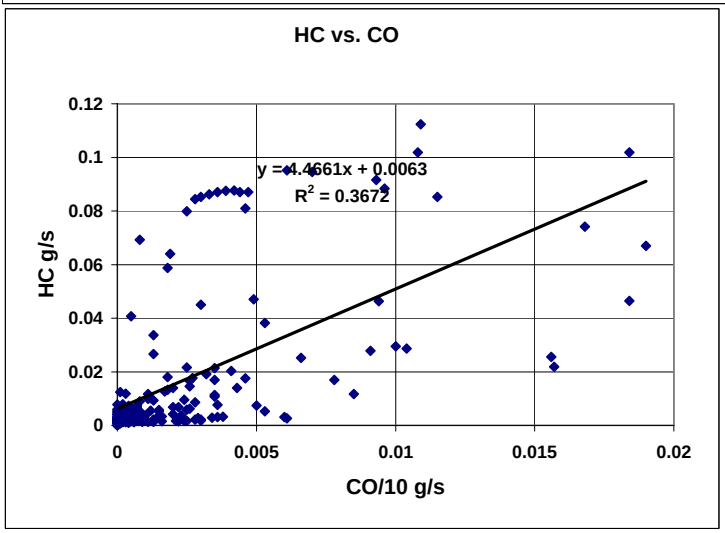


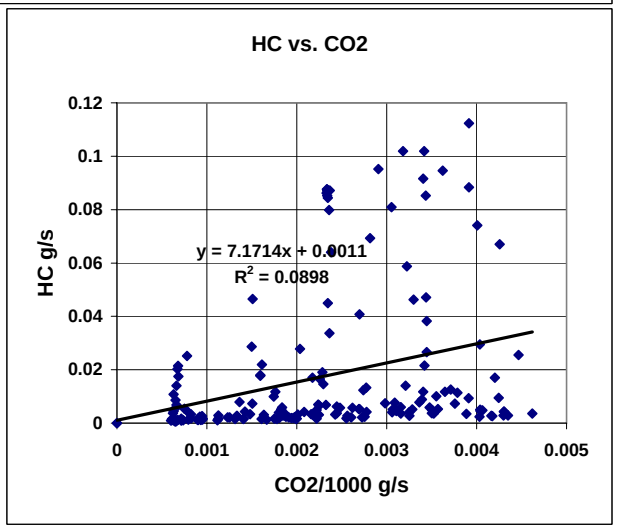
Ref:	**40**			**Leak predicted:**	**No**
Cert:	**3035080**	**VIN:**	**1HGCB7263MA058042**	**Make:**	**HOND**
Year:	**1991**	**Model:**	**ACCORD**	**HC g/mi:**	**2.89**
		HCLP:	**No**	**CO g/mi:**	**4.10**
		Note:	**0**		

Avg HC when CO2 low g/s:		**0.004**	**Stdev %:**	**138%**	**Avg HC-$HC_{CO:}$**	**0.006**	
HC vs. CO:	**A:**	**4.47**	**B:**	**0.006**	**R^2:**	**0.37**	**Stdev HC-$HC_{CO:}$** **0.022**
HC vs. CO2	**A:**	**7.17**	**B:**	**0.001**	**R^2:**	**0.09**	**Stdev HC-$HC_{CO2:}$** **0.026**









Ref: 41 | Leak predicted: No

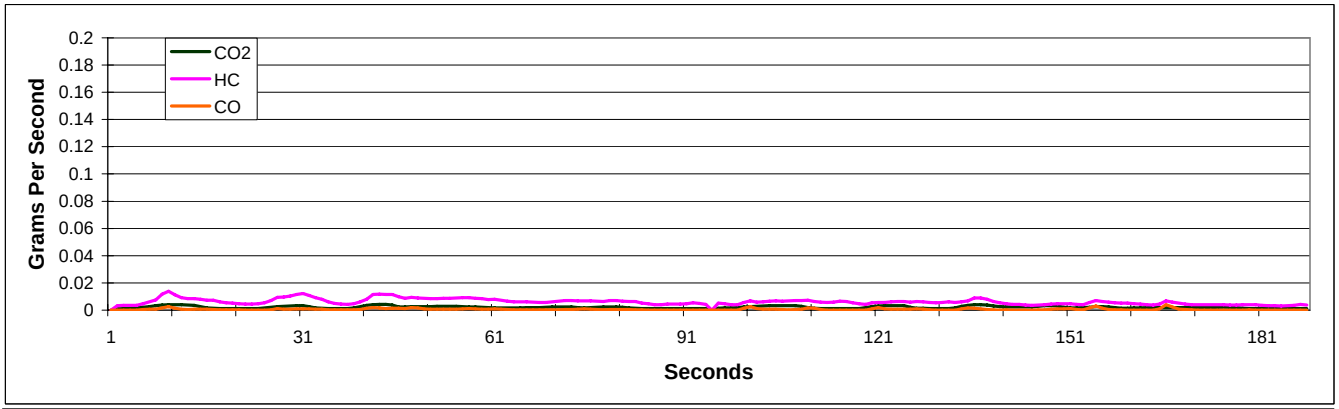
Cert: 3035097 | VIN: 1G1JC1444P7112406 | Make: CHEV

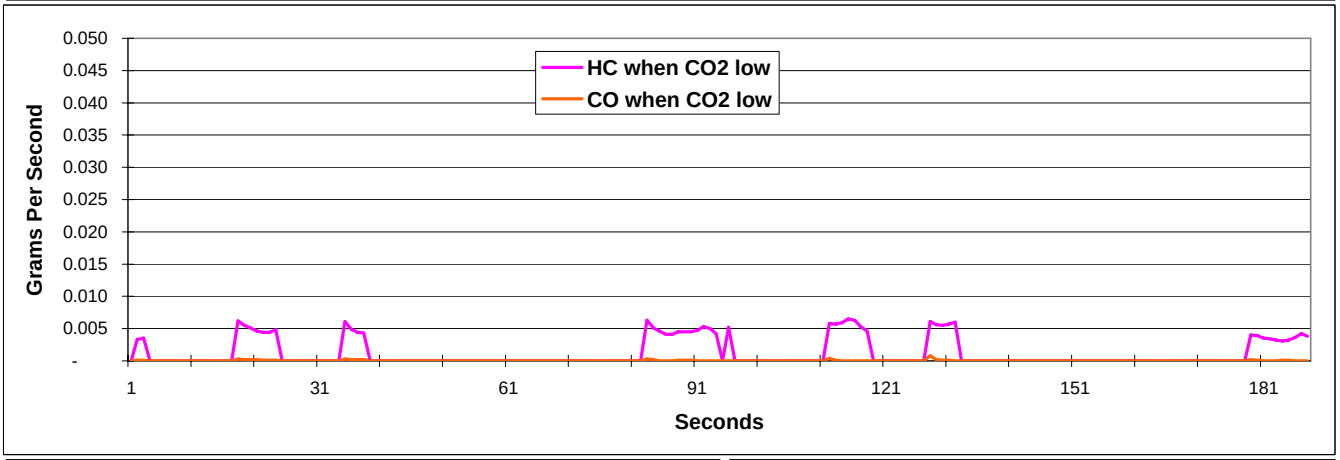
Year: 1993 | Model: CAVALI | HC g/mi: 1.01

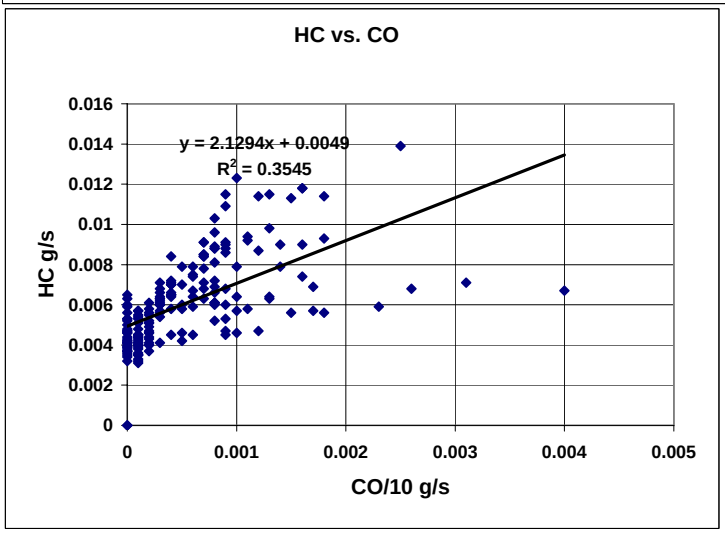
HCLP: Yes | CO g/mi: 0.91

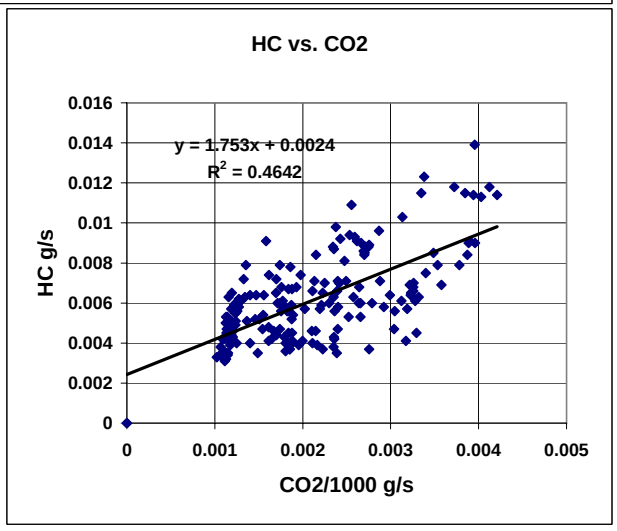
Note: R center - fuel filter area

Avg HC when CO2 low g/s:		0.005	Stdev %:	25%	Avg HC-HC_{CO_2}:	0.005		
HC vs. CO:	A:	2.13	B:	0.005	R^2:	0.35	Stdev HC-HC_{CO_2}:	0.002
HC vs. CO2	A:	1.75	B:	0.002	R^2:	0.46	Stdev HC-HC_{CO_2}:	0.002



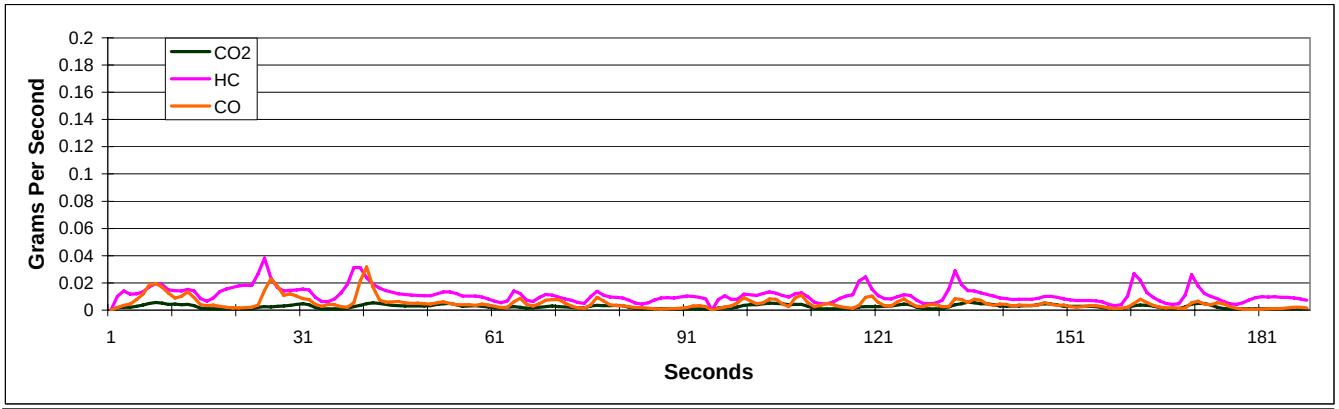


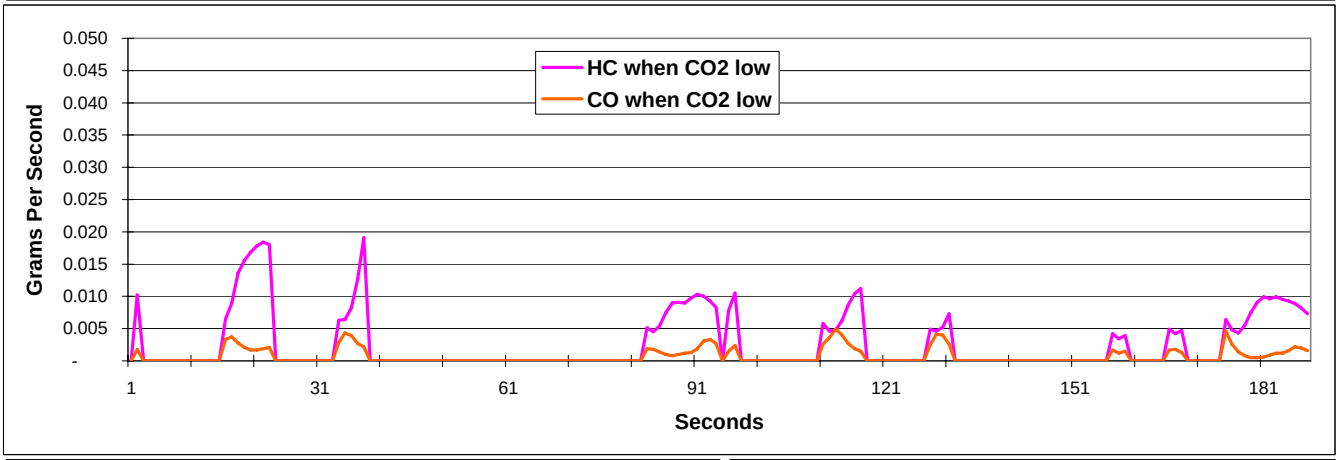


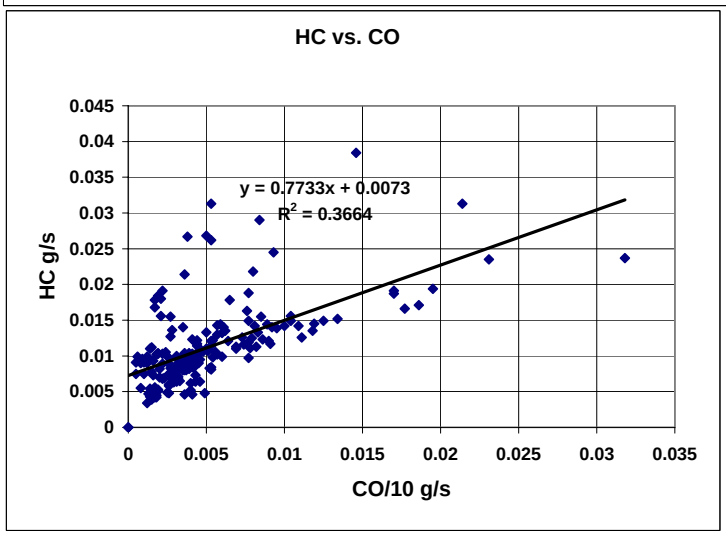


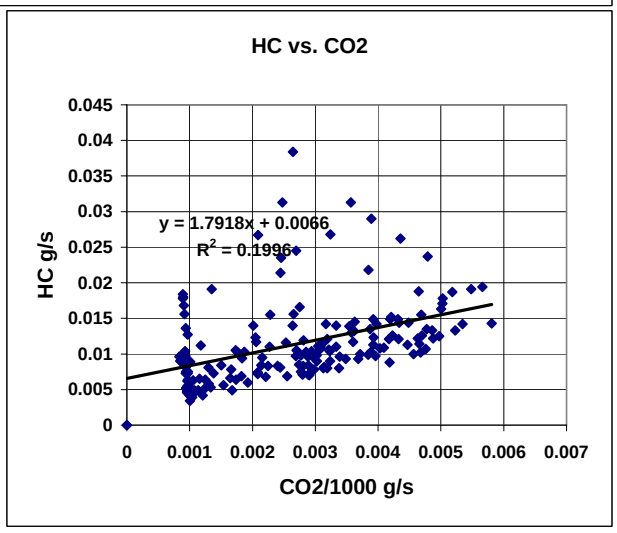
Ref: 42				**Leak predicted:**	Yes
Cert: 3028146	**VIN:** 1GNDM19W6SB114084		**Make:** CHEV		
Year: 1995	**Model:** ASTRO			**HC g/mi:**	1.87
	HCLP: No			**CO g/mi:**	8.49
	Note: 0				

Avg HC when CO2 low g/s:	0.008	**Stdev %:**	48%	**Avg HC-$HC_{CO:}$**	0.007		
HC vs. CO:	**A:** 0.77	**B:**	0.007	**R^2:**	0.37	**Stdev HC-$HC_{CO:}$**	0.005
HC vs. CO2	**A:** 1.79	**B:**	0.007	**R^2:**	0.20	**Stdev HC-$HC_{CO2:}$**	0.005



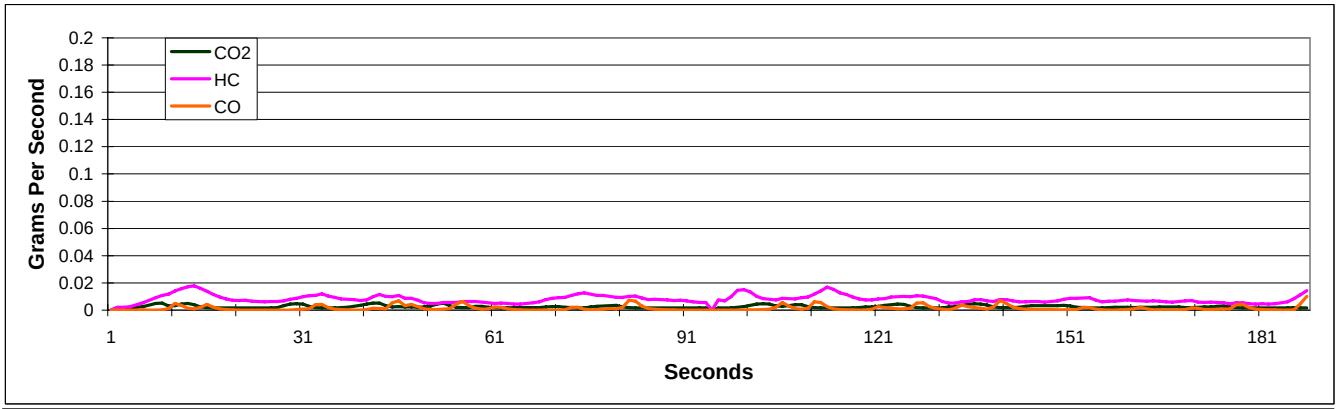


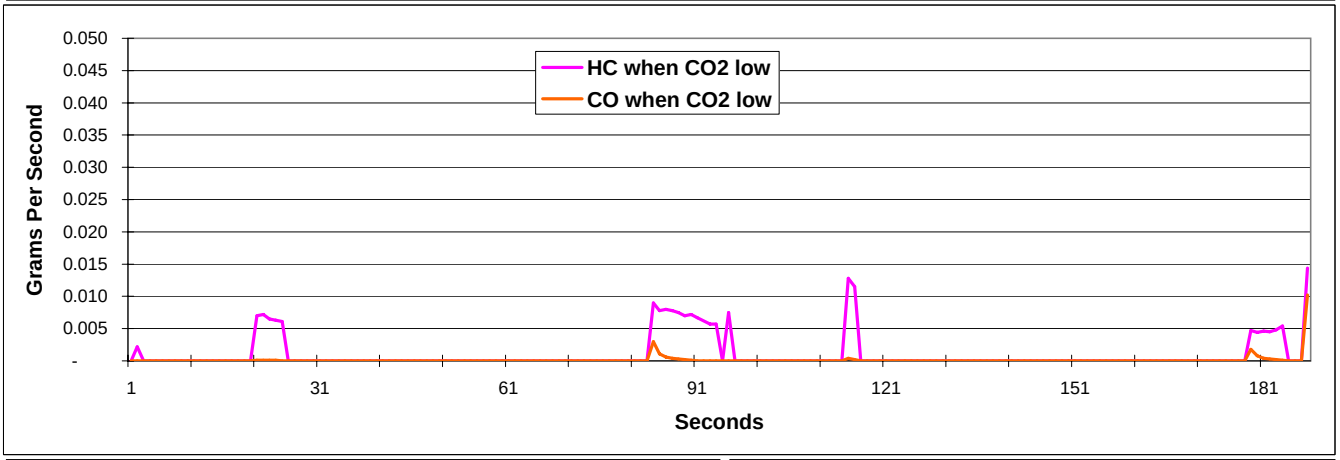


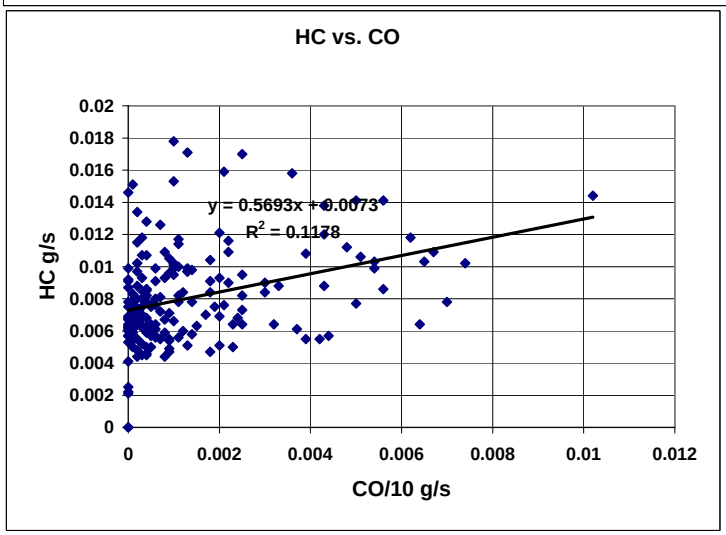


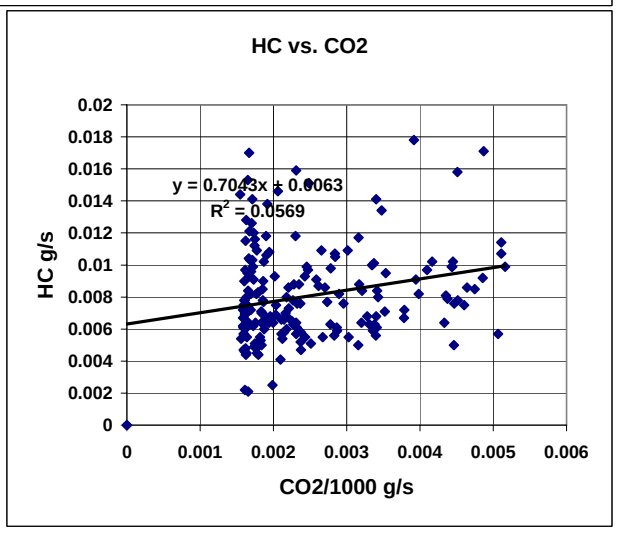
Ref: 44				**Leak predicted:**	Yes
Cert: 3015053	**VIN:** 2C3EL56TXPH614009		**Make:** CHRY		
Year: 1993	**Model:** CONCOR			**HC g/mi:**	1.32
	HCLP: Yes			**CO g/mi:**	2.22
	Note: left bank - cyl 4,6 at injector rail				

Avg HC when CO2 low g/s:	0.007	**Stdev %:**	40%	**Avg HC-$HC_{CO:}$**	0.007		
HC vs. CO:	**A:** 0.57	**B:**	0.007	**R^2:**	0.12	**Stdev HC-$HC_{CO:}$**	0.003
HC vs. CO2	**A:** 0.70	**B:**	0.006	**R^2:**	0.06	**Stdev HC-$HC_{CO2:}$**	0.003



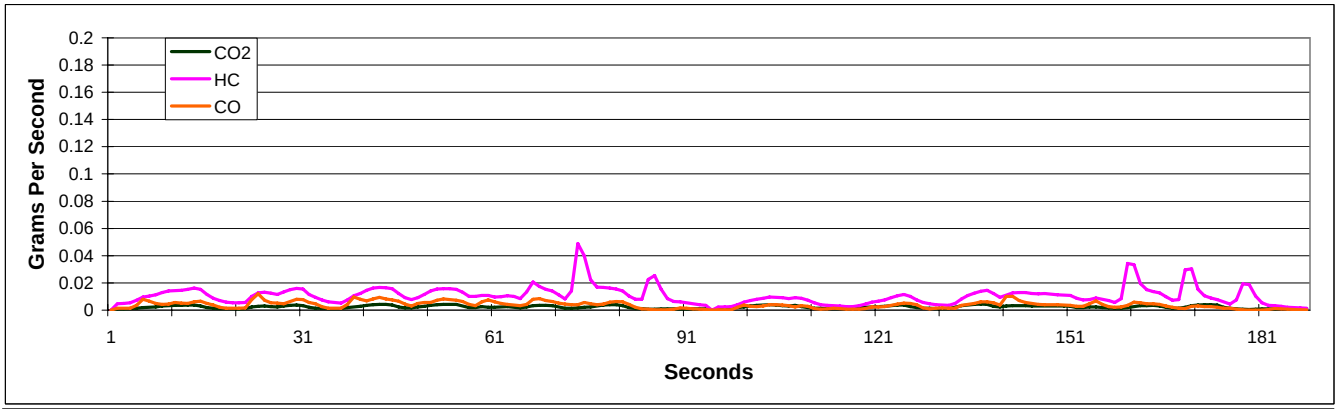


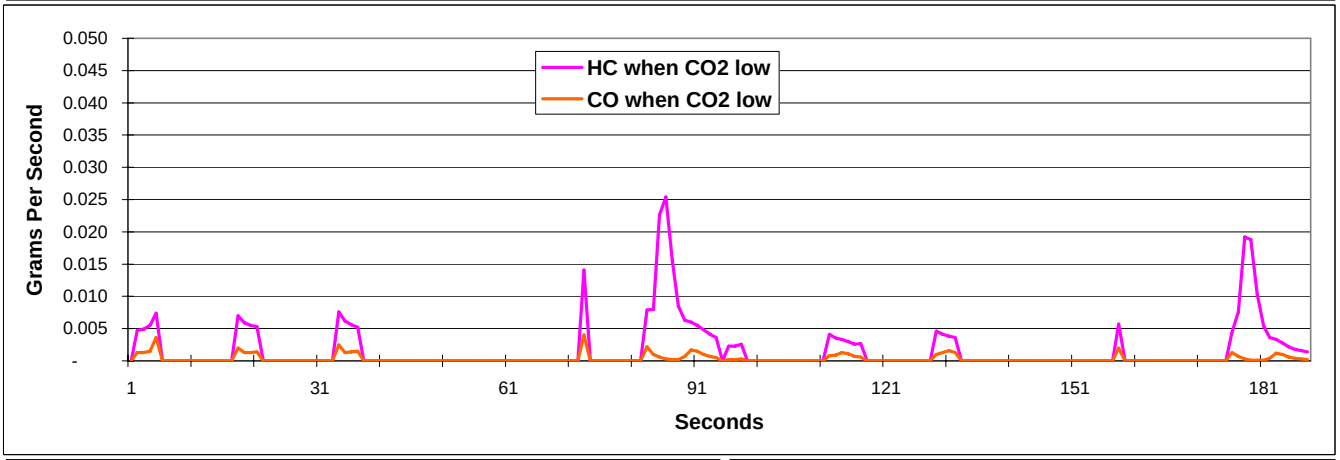


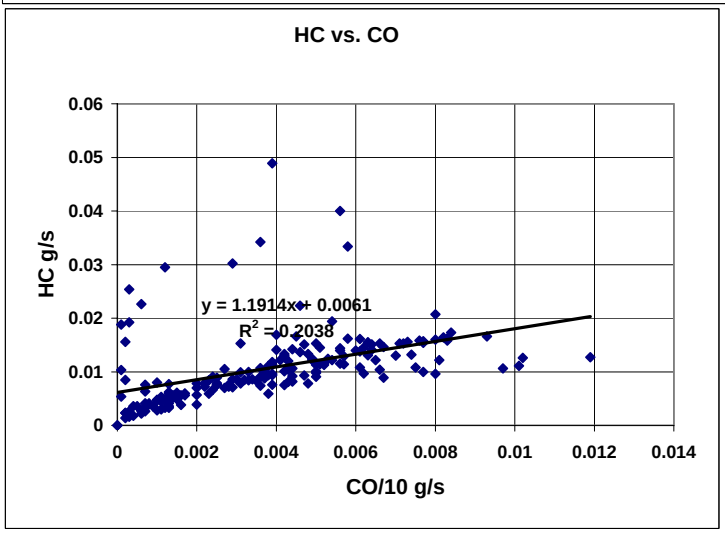


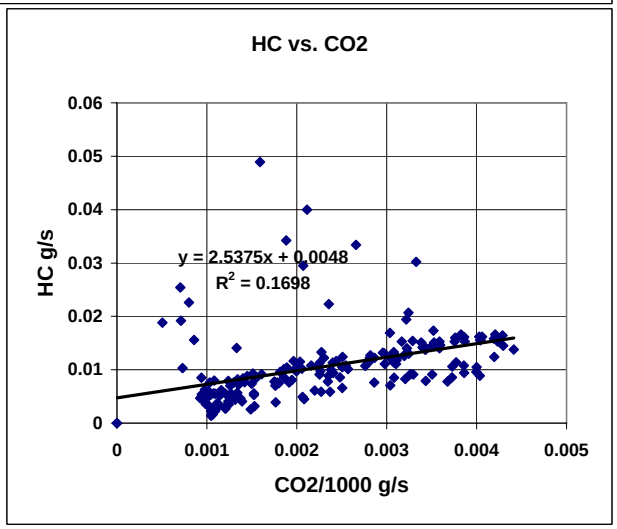
Ref: 45				**Leak predicted:**	No
Cert: 2617149	**VIN:** 1G1JC8445P7257821		**Make:** CHEV		
Year: 1993	**Model:** CAVALI			**HC g/mi:**	1.83
	HCLP: No			**CO g/mi:**	6.45
	Note: 0				

Avg HC when CO2 low g/s:		**0.006**	**Stdev %:**	**86%**	**Avg HC-$HC_{CO:}$**	**0.006**	
HC vs. CO:	**A:**	**1.19**	**B:**	**0.006**	**R^2:**	**0.20**	**Stdev HC-$HC_{CO:}$** **0.006**
HC vs. CO2	**A:**	**2.54**	**B:**	**0.005**	**R^2:**	**0.17**	**Stdev HC-$HC_{CO2:}$** **0.006**



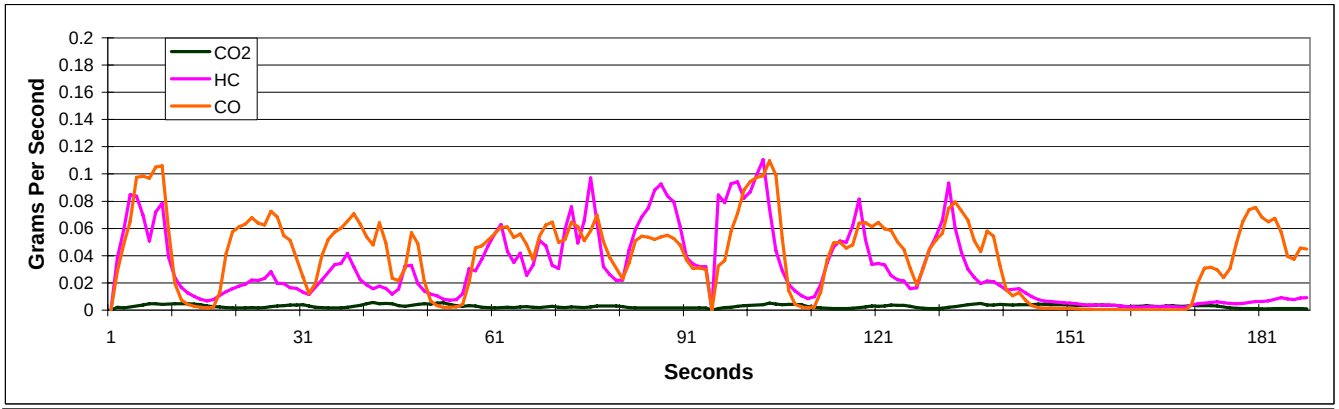


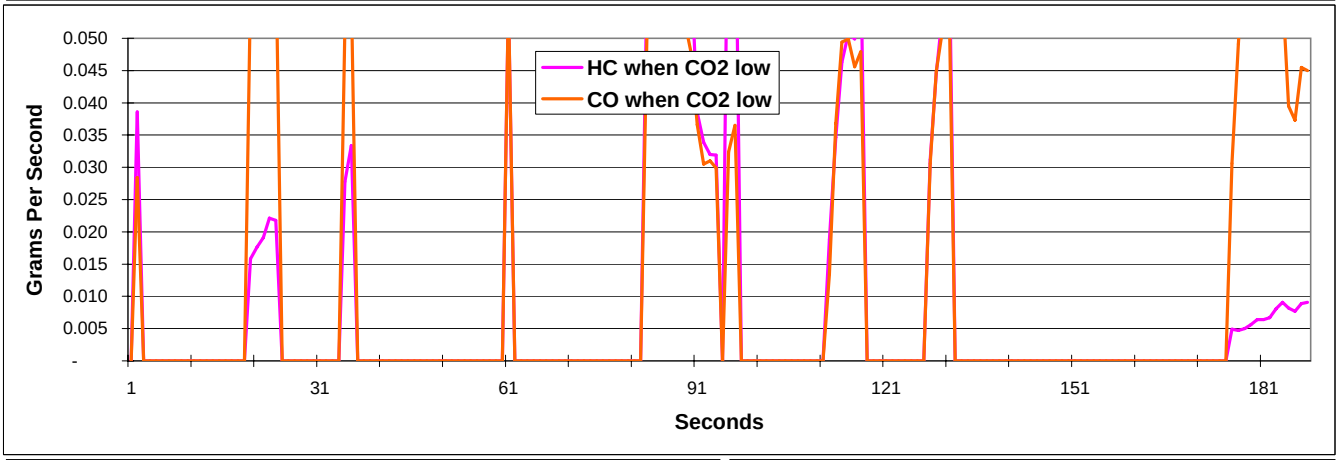


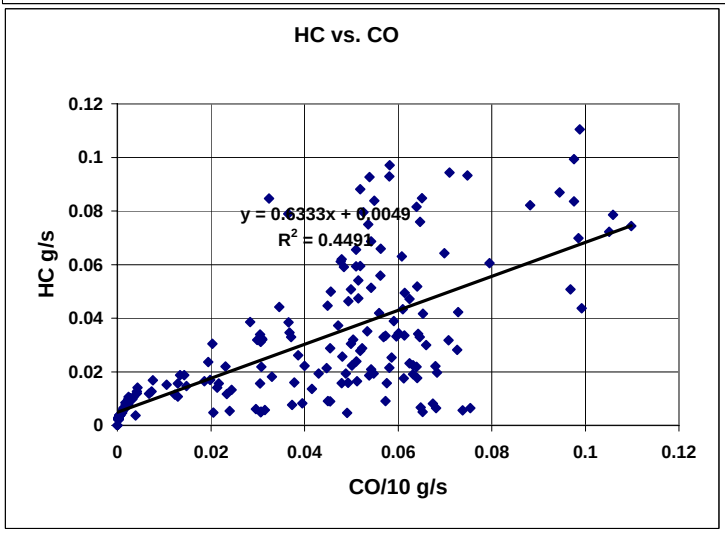


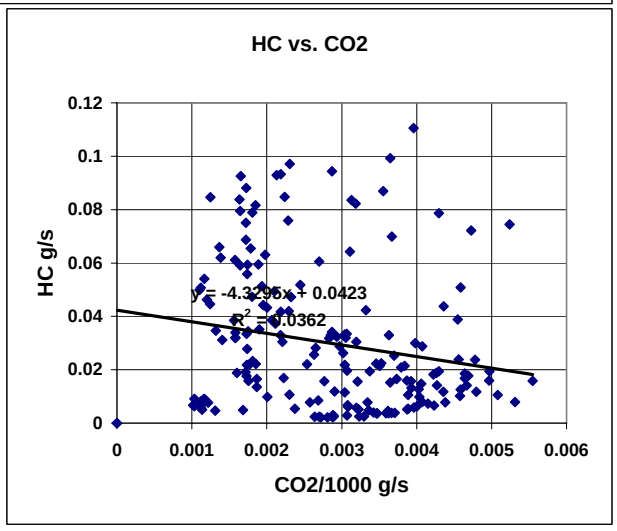
Ref: 47				**Leak predicted:**	Yes
Cert: 2916747	**VIN:** 1GNCS13W8S2116543		**Make:** CHEV		
Year: 1995	**Model:** BLAZER			**HC g/mi:**	5.00
	HCLP: No			**CO g/mi:**	65.96
	Note: 0				

Avg HC when CO2 low g/s:	0.036	**Stdev %:**	77%	**Avg HC-HC_{CO_2}:**	0.005		
HC vs. CO:	**A:** 0.63	**B:**	0.005	**R^2:**	0.45	**Stdev HC-HC_{CO_2}:**	0.020
HC vs. CO2	**A:** (4.33)	**B:**	0.042	**R^2:**	0.04	**Stdev HC-HC_{CO_2}:**	0.026



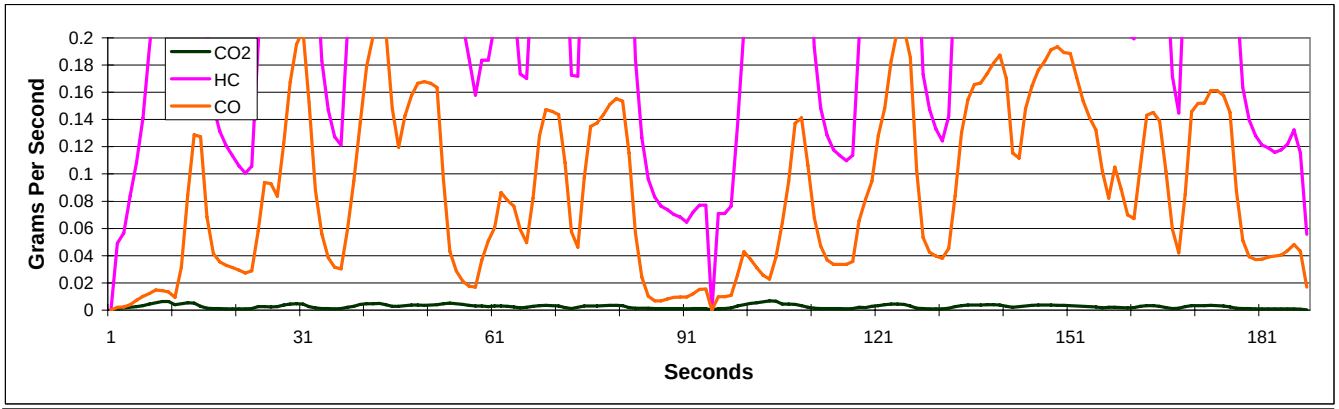


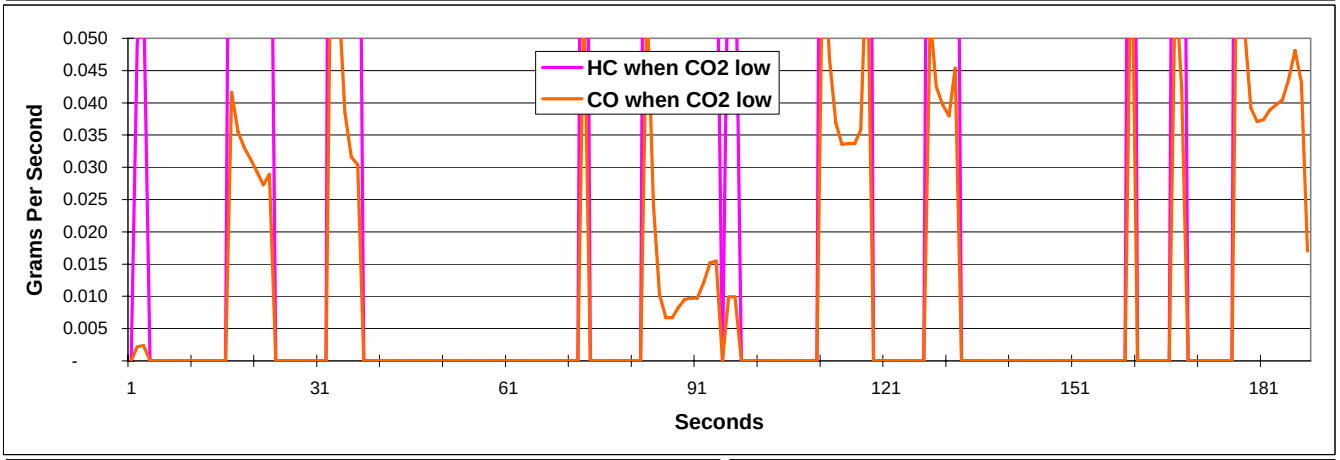


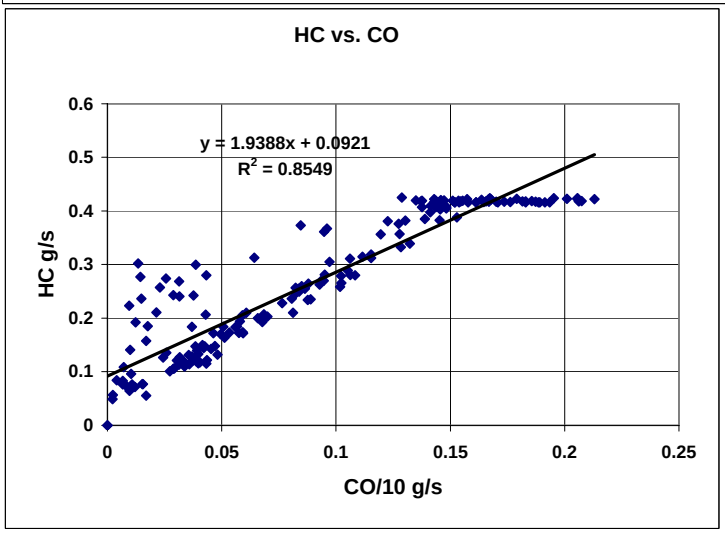


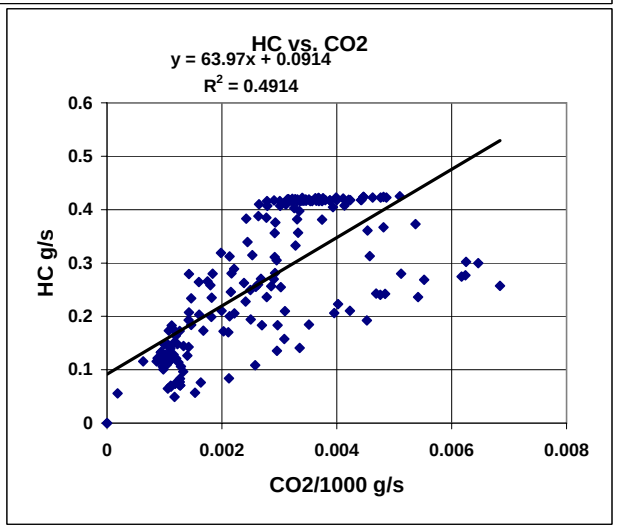
Ref: 48				Leak predicted:	Yes
Cert: 2922800	VIN: 1G4CW53L7M1665701		Make: BUIC		
Year: 1991	Model: PARK A			HC g/mi:	45.10
	HCLP: No			CO g/mi:	151.48
	Note: 0				

Avg HC when CO2 low g/s:	0.125	Stdev %:	37%	Avg HC-$HC_{CO:}$	0.092		
HC vs. CO:	A:	1.94	B:	0.092	R^2:	0.85	Stdev HC-$HC_{CO:}$ 0.049
HC vs. CO2	A:	63.97	B:	0.091	R^2:	0.49	Stdev HC-$HC_{CO2:}$ 0.092



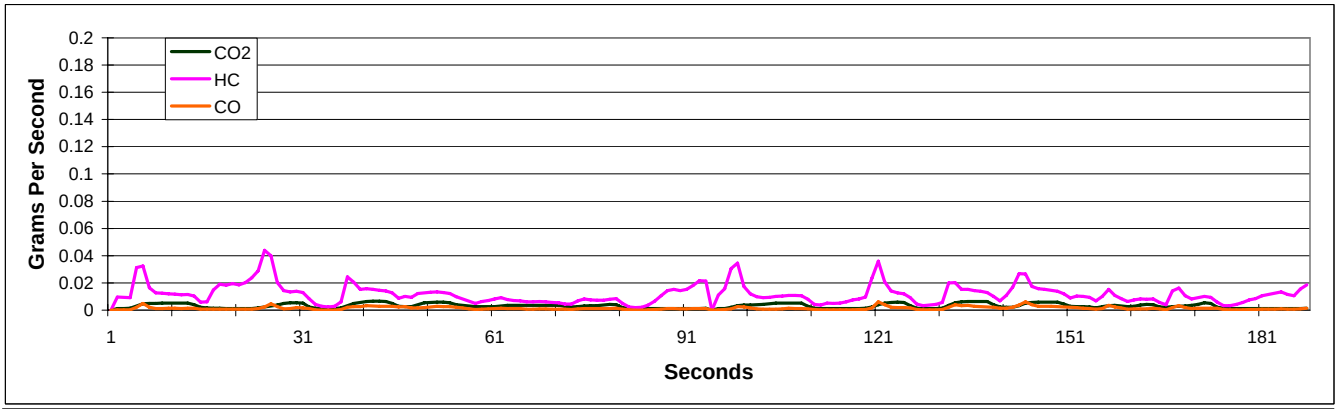


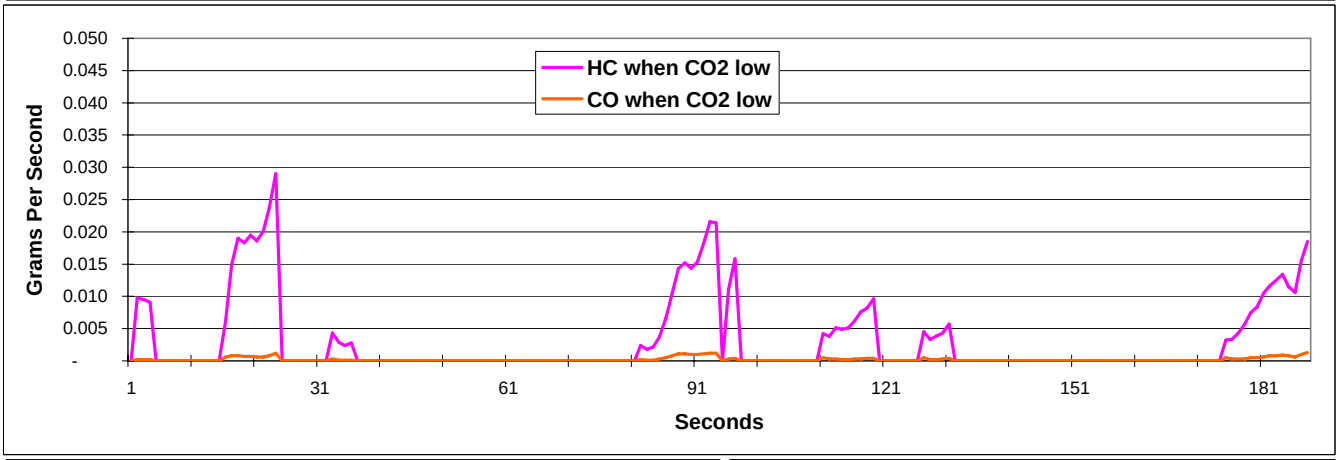


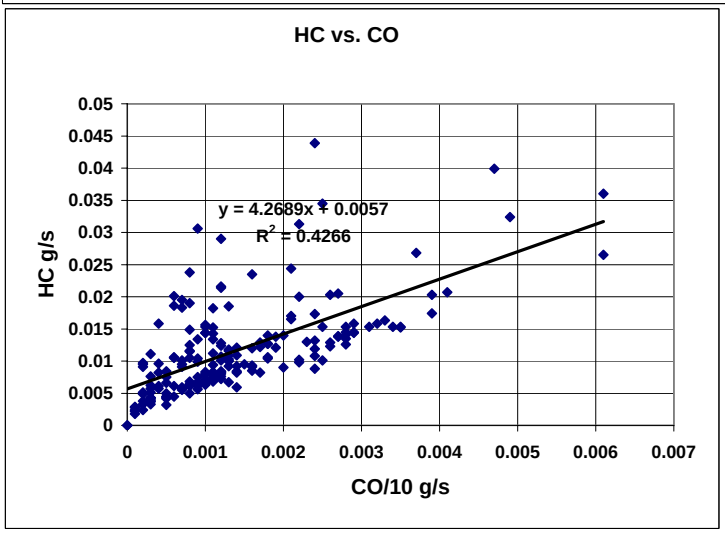


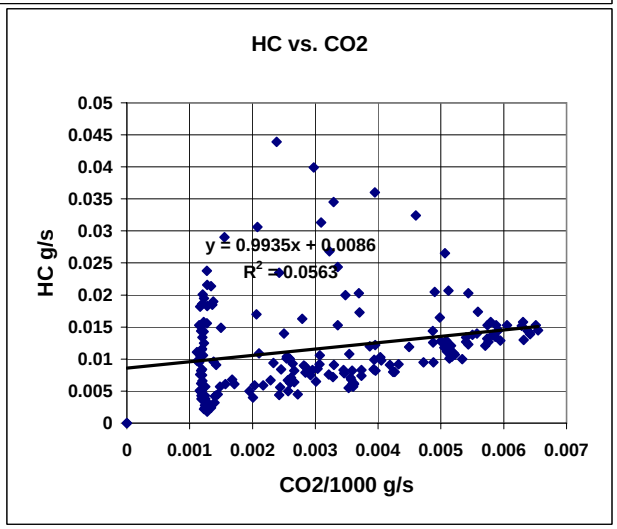
Ref: 49				**Leak predicted:**	Yes
Cert: 2916755	**VIN:** JT3VN39W4R0147195		**Make:** TOYT		
Year: 1994	**Model:** 4RUNNE			**HC g/mi:**	1.97
	HCLP: No			**CO g/mi:**	2.37
	Note: 0				

Avg HC when CO2 low g/s:	0.010	**Stdev %:**	68%	**Avg HC-HC_{CO_2}:**	0.006		
HC vs. CO:	**A:** 4.27	**B:**	0.006	**R^2:**	0.43	**Stdev HC-HC_{CO_2}:**	0.005
HC vs. CO2	**A:** 0.99	**B:**	0.009	**R^2:**	0.06	**Stdev HC-HC_{CO_2}:**	0.007



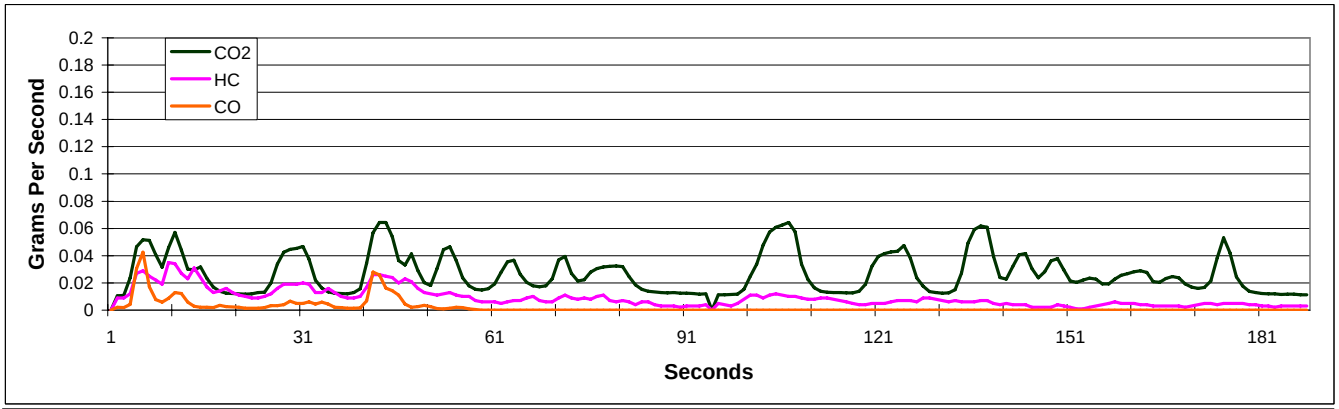


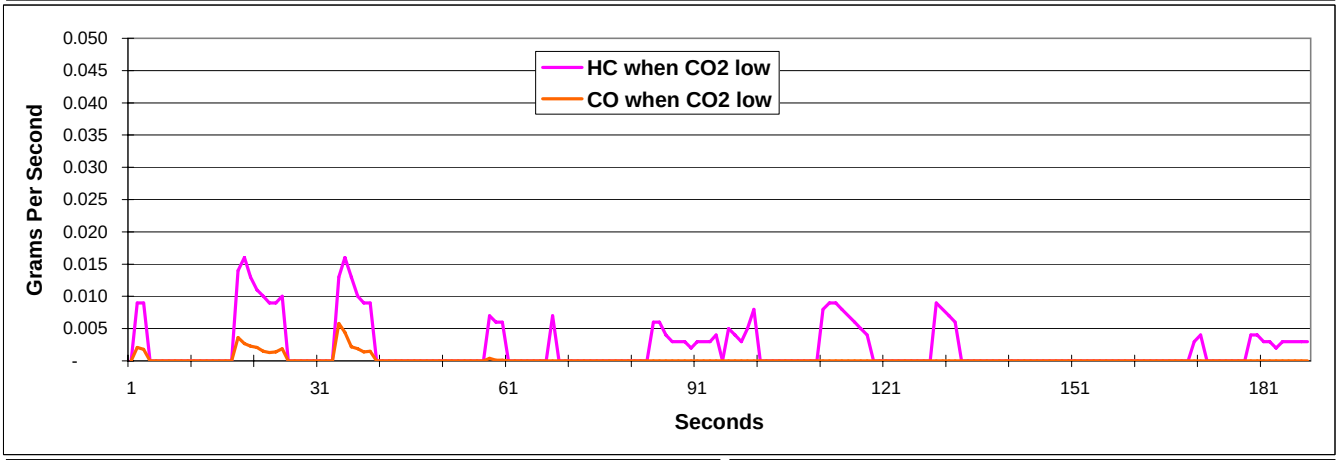


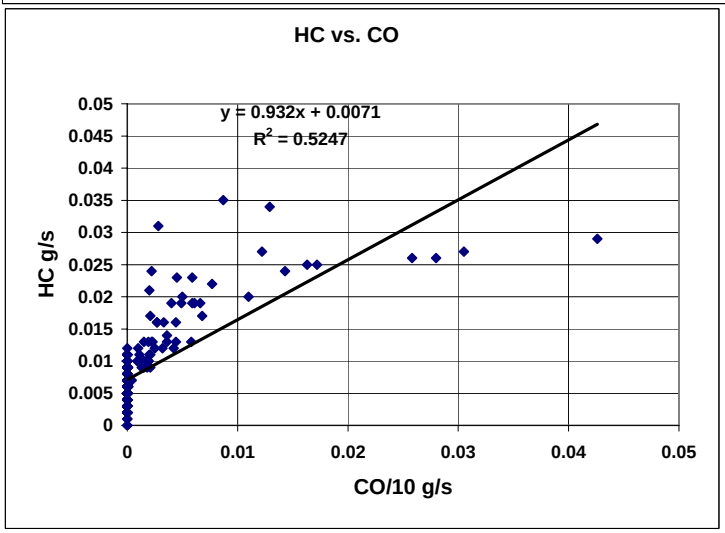


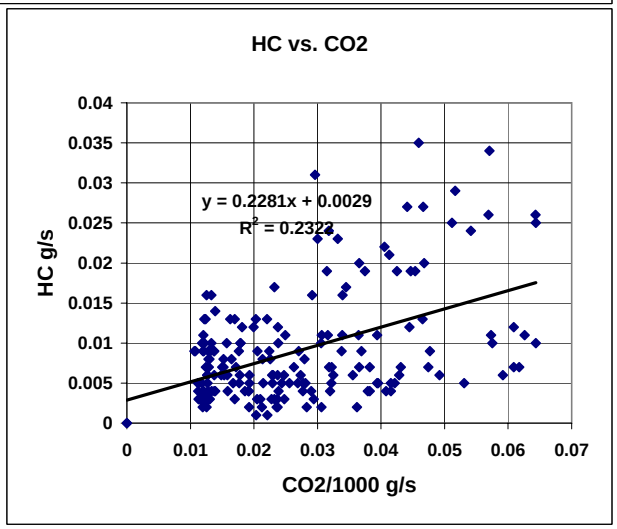
Ref: 50				**Leak predicted:**	No
Cert: 3029127	**VIN:** 1G1FP33E2ML130051		**Make:** CHEV		
Year: 1991	**Model:** CAMARO			**HC g/mi:**	1.48
	HCLP: Yes			**CO g/mi:**	3.18
	Note: LS tank / air cleaner				

Avg HC when CO2 low g/s:	0.006	**Stdev %:**	58%	**Avg HC-$HC_{CO:}$**	0.007		
HC vs. CO:	**A:** 0.93	**B:**	0.007	**R^2:**	0.52	**Stdev HC-$HC_{CO:}$**	0.005
HC vs. CO2	**A:** 0.23	**B:**	0.003	**R^2:**	0.23	**Stdev HC-$HC_{CO2:}$**	0.006



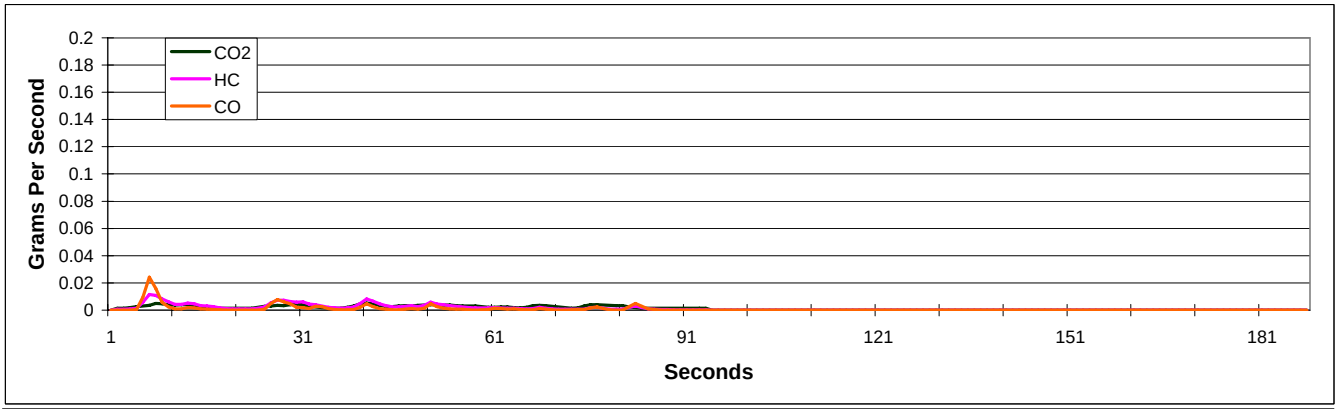


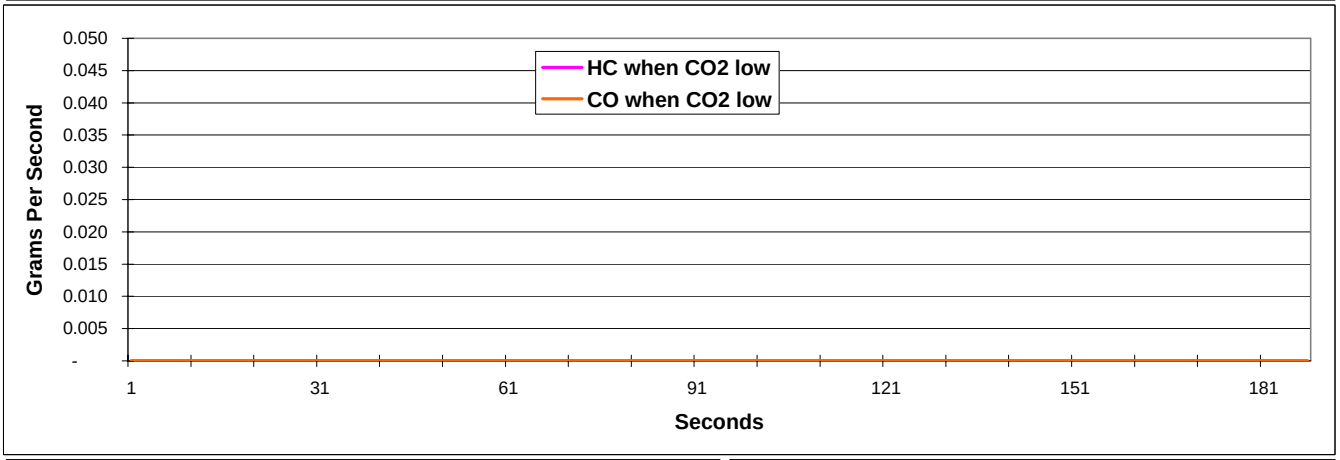


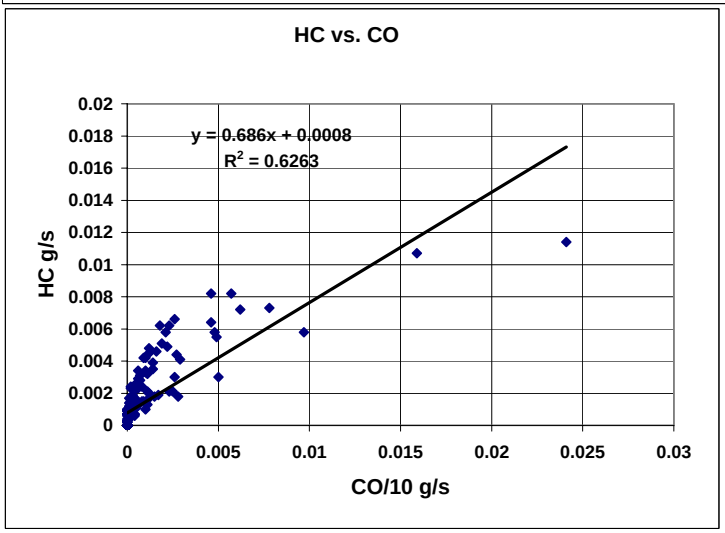


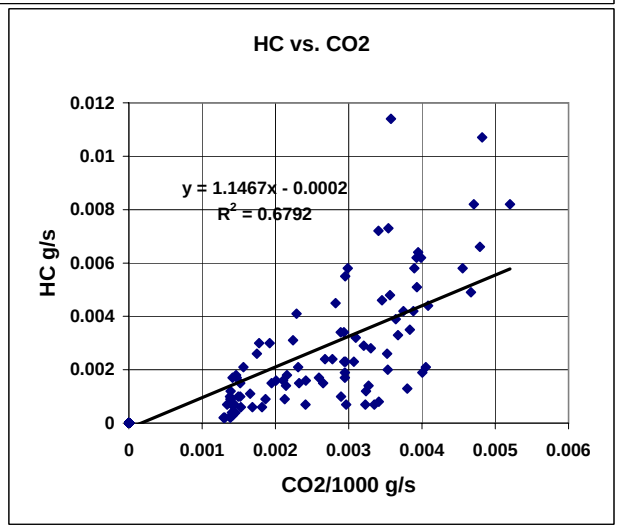
Ref: 51				**Leak predicted:** #VALUE!
Cert: 3028767	**VIN:** 1G1LV15M1SY229476		**Make:** CHEV	
Year: 1995	**Model:** BERETT		**HC g/mi:** 0.45	
	HCLP: No		**CO g/mi:** #VALUE!	
	Note: 0			

Avg HC when CO2 low g/s: #VALUE!	**Stdev %:** #VALUE!	**Avg HC-$HC_{CO:}$** #VALUE!		
HC vs. CO:	**A:** #VALUE!	**B:** #VALUE!	**R^2:** #VALUE!	**Stdev HC-$HC_{CO:}$** #######
HC vs. CO2	**A:** #VALUE!	**B:** #VALUE!	**R^2:** #VALUE!	**Stdev HC-$HC_{CO2:}$** #######



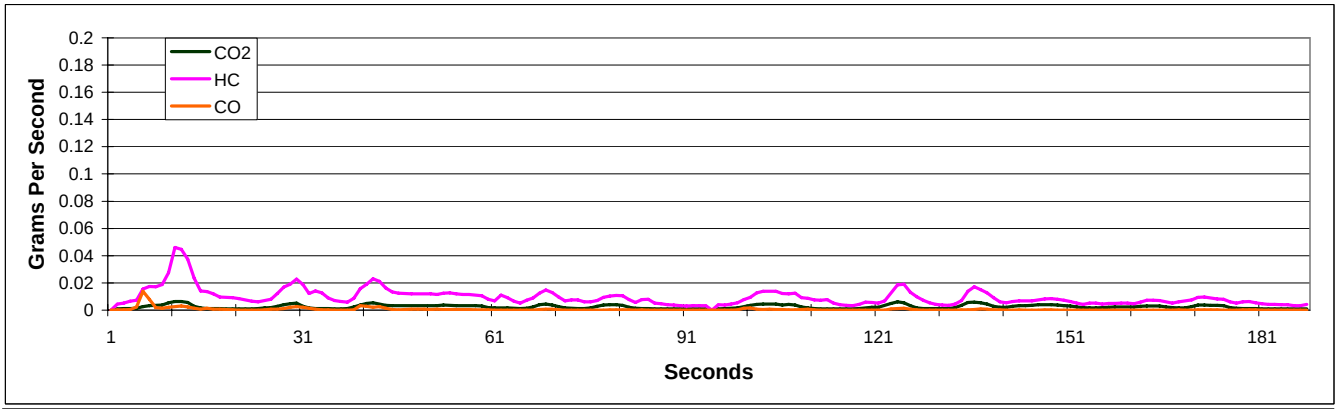


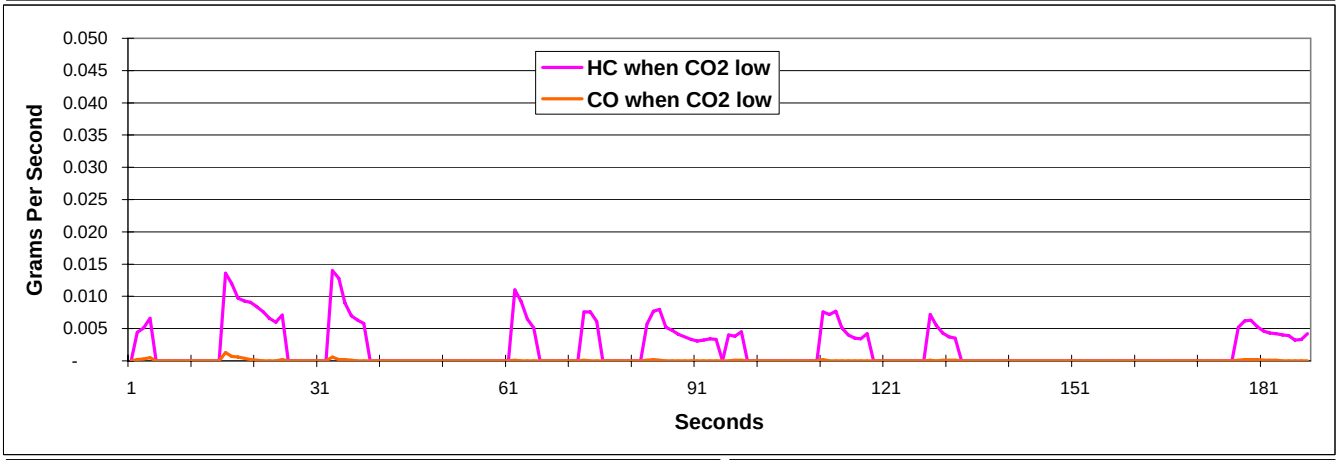


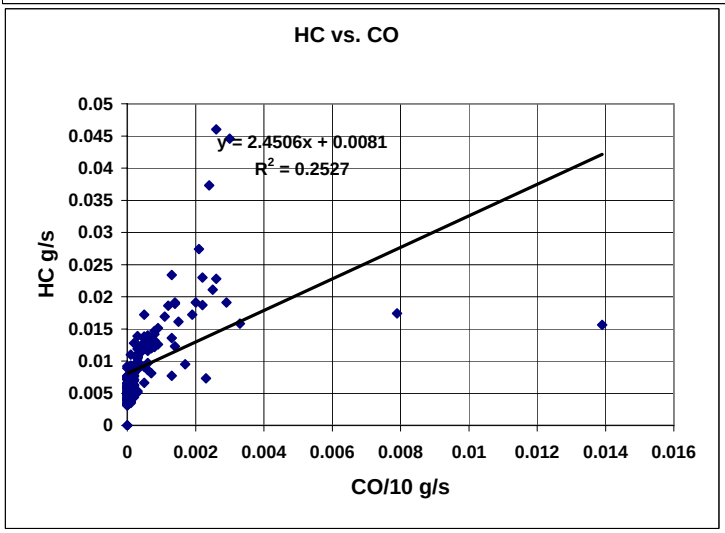


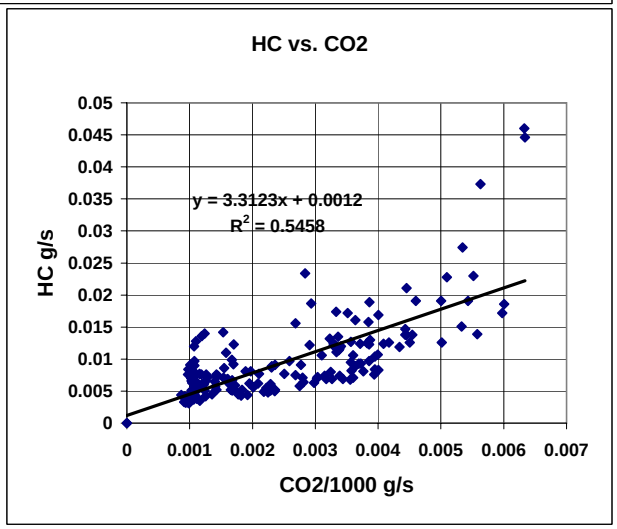
Ref: 52				**Leak predicted:**	No
Cert: 3029433	**VIN:** 1G1BN53E4MW158822		**Make:** CHEV		
Year: 1991	**Model:** CAPRIC			**HC g/mi:**	1.53
	HCLP: No			**CO g/mi:**	0.88
	Note: 0				

Avg HC when CO2 low g/s:	0.006	**Stdev %:**	46%	**Avg HC-$HC_{CO:}$**	0.008		
HC vs. CO:	**A:** 2.45	**B:** 0.008		**R^2:**	0.25	**Stdev HC-$HC_{CO:}$**	0.005
HC vs. CO2	**A:** 3.31	**B:** 0.001		**R^2:**	0.55	**Stdev HC-$HC_{CO2:}$**	0.004



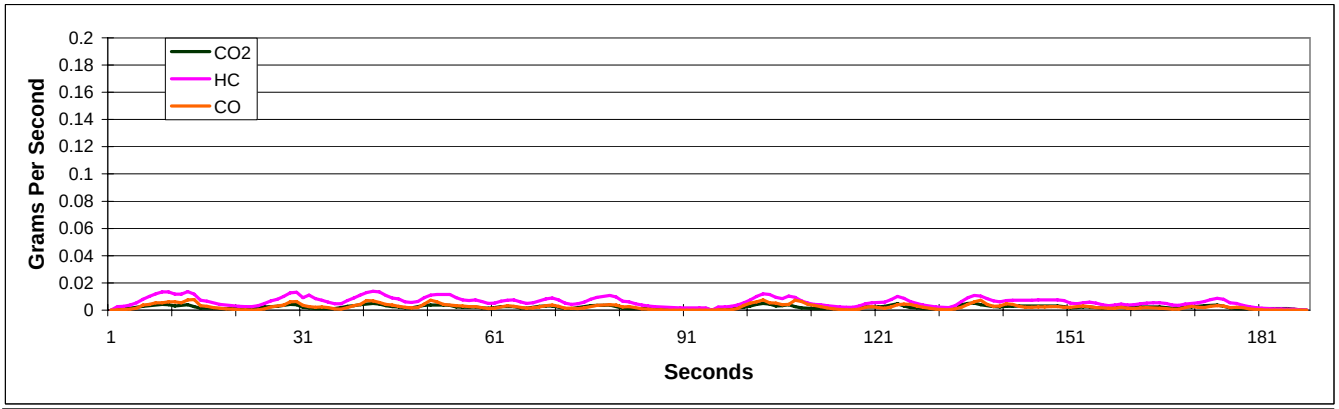


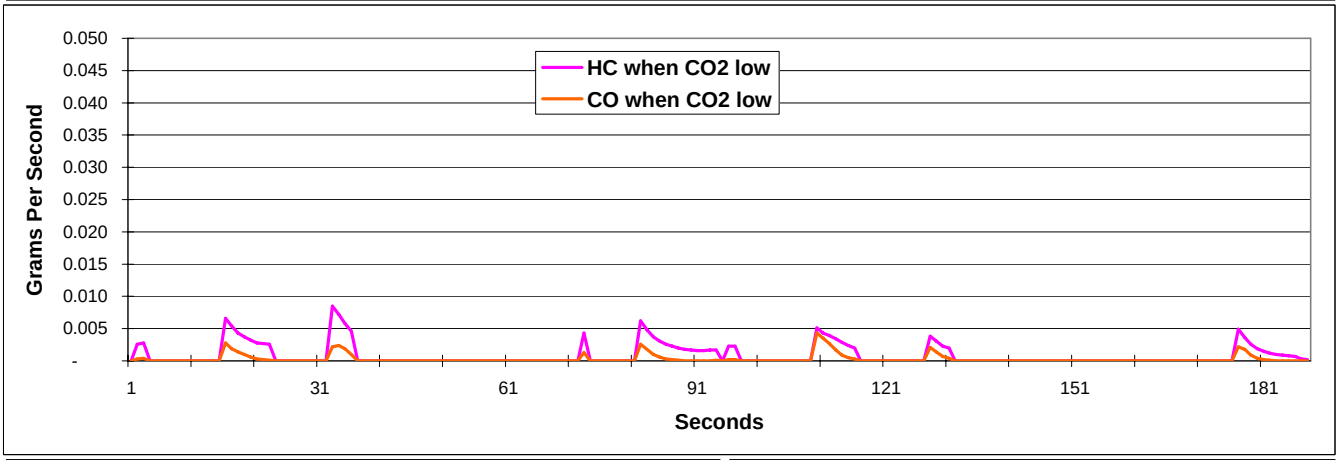


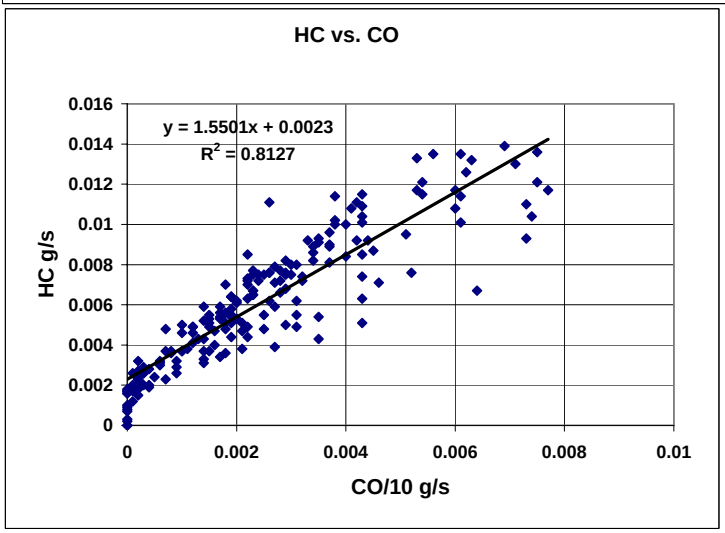


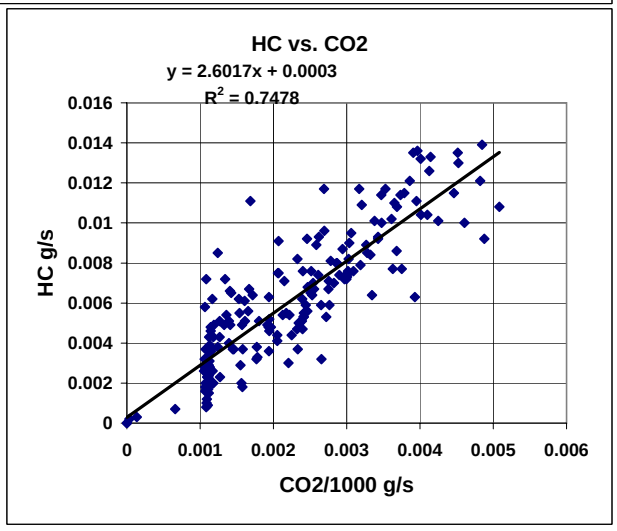
Ref: 53				**Leak predicted:**	No
Cert: 3035661	**VIN:** 1G3AL54R7M6359821		**Make:** OLDS		
Year: 1991	**Model:** CUTLAS			**HC g/mi:**	1.01
	HCLP: No			**CO g/mi:**	4.07
	Note: 0				

Avg HC when CO2 low g/s:		**0.003**	**Stdev %:**	**61%**	**Avg HC-HC_{CO_2}**	**0.002**	
HC vs. CO:	**A:**	**1.55**	**B:**	**0.002**	**R^2:**	**0.81**	**Stdev HC-HC_{CO_2}** **0.001**
HC vs. CO2	**A:**	**2.60**	**B:**	**0.000**	**R^2:**	**0.75**	**Stdev HC-HC_{CO_2}** **0.002**



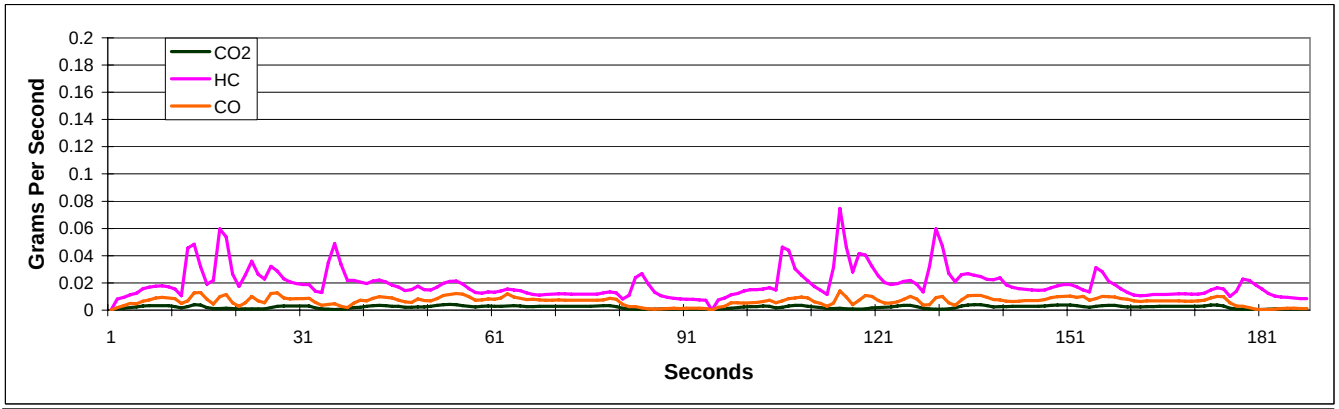


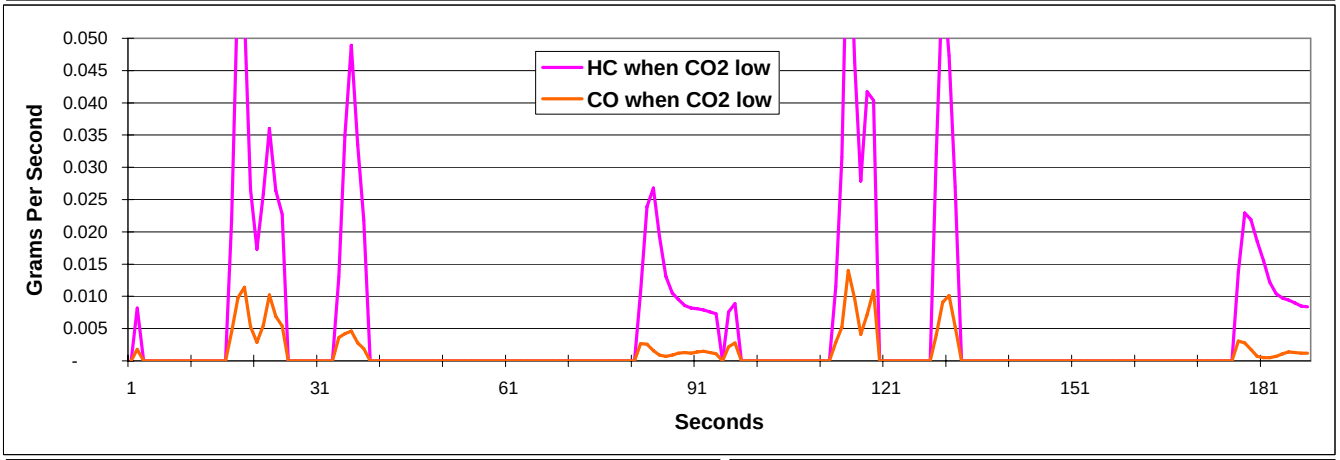


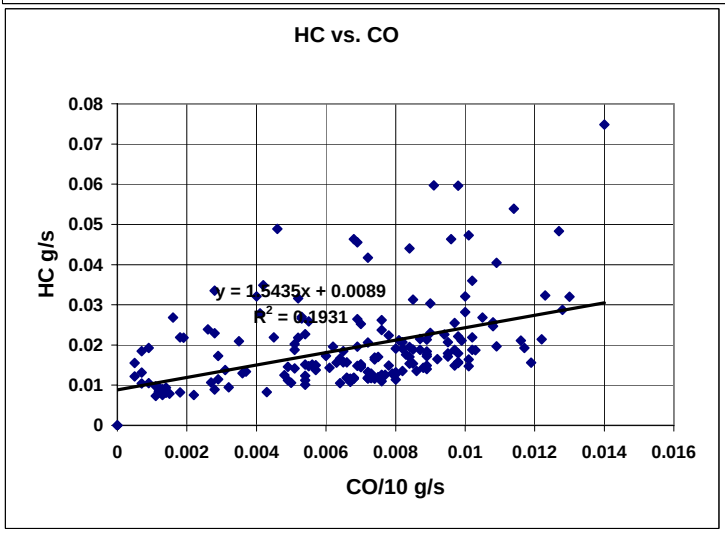


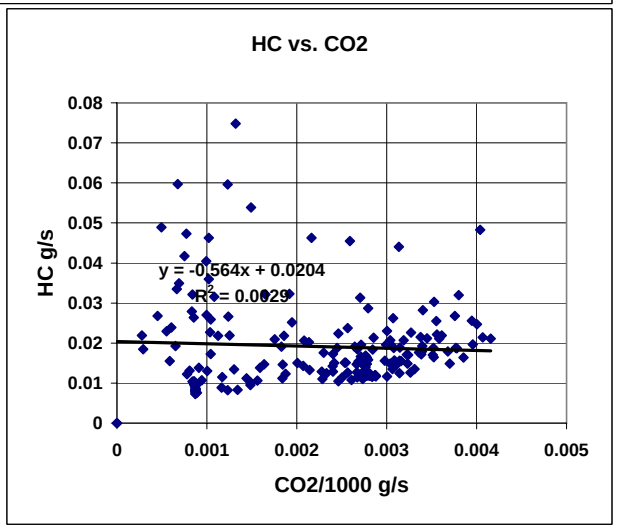
Ref: 58				**Leak predicted:** Yes	
Cert: 3029640	**VIN:** JN1HU11P7HT306229		**Make:** NISS		
Year: 1987	**Model:** MAXIMA			**HC g/mi:**	3.31
	HCLP: No			**CO g/mi:**	11.51
	Note: 0				

Avg HC when CO2 low g/s:		**0.023**	**Stdev %:**	**71%**	**Avg HC-HC$_{CO:}$**	**0.009**	
HC vs. CO:	**A:**	**1.54**	**B:**	**0.009**	**R^2:**	**0.19**	**Stdev HC-HC$_{CO:}$** **0.010**
HC vs. CO2	**A:**	**(0.56)**	**B:**	**0.020**	**R^2:**	**0.00**	**Stdev HC-HC$_{CO2:}$** **0.011**



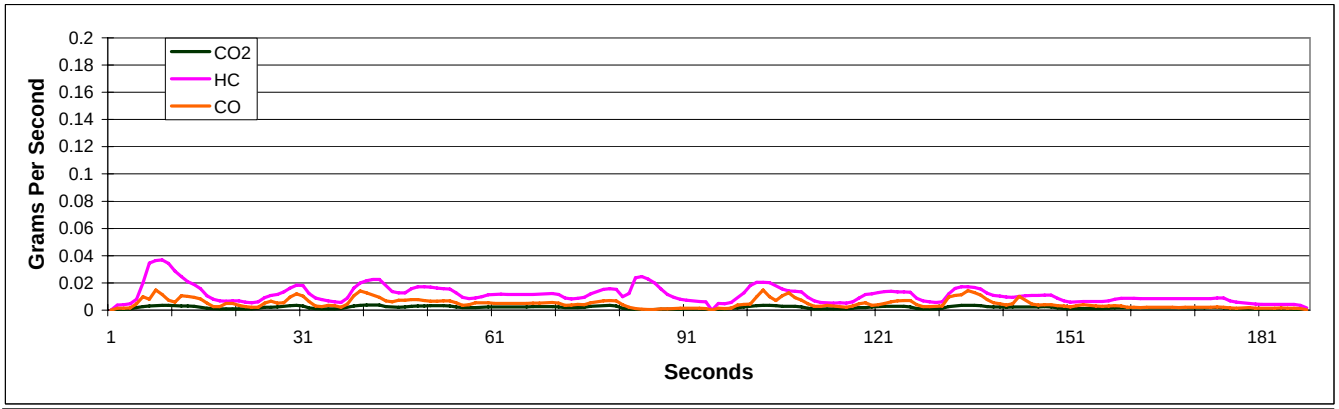


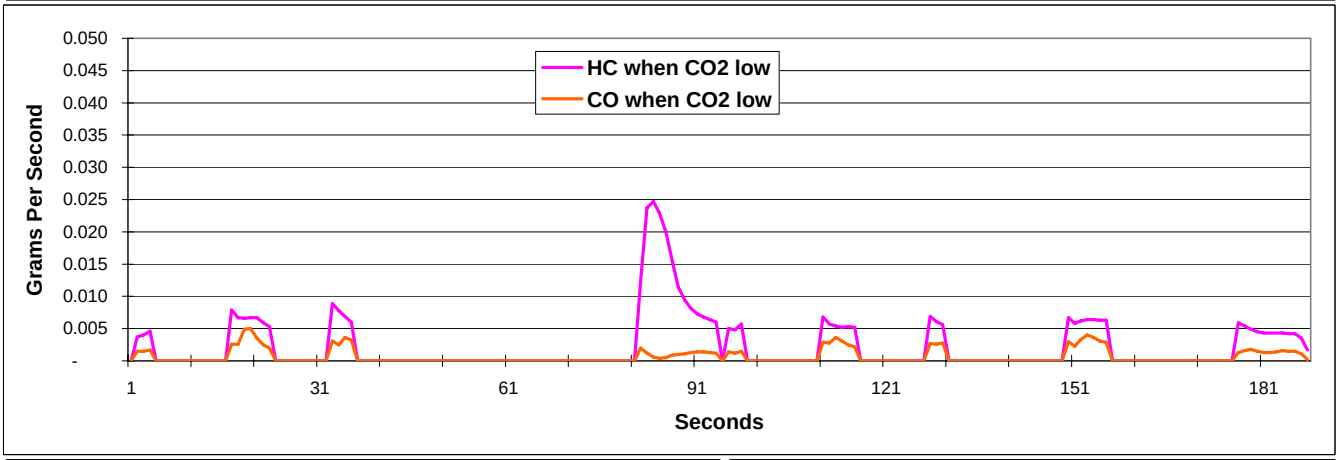


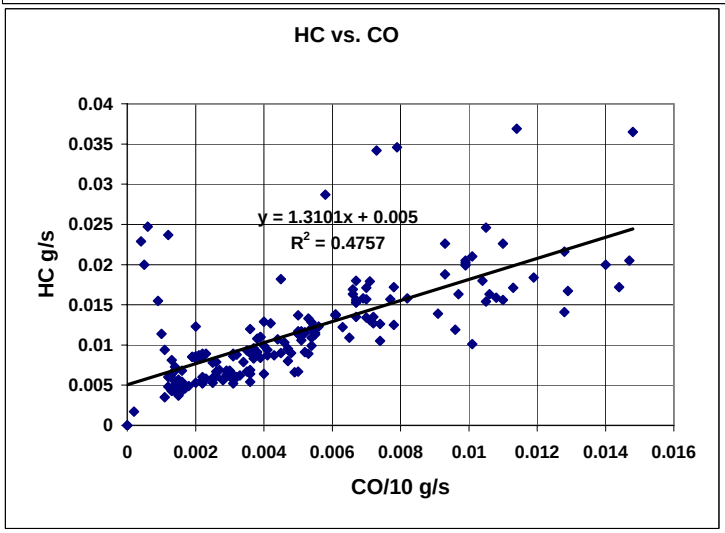


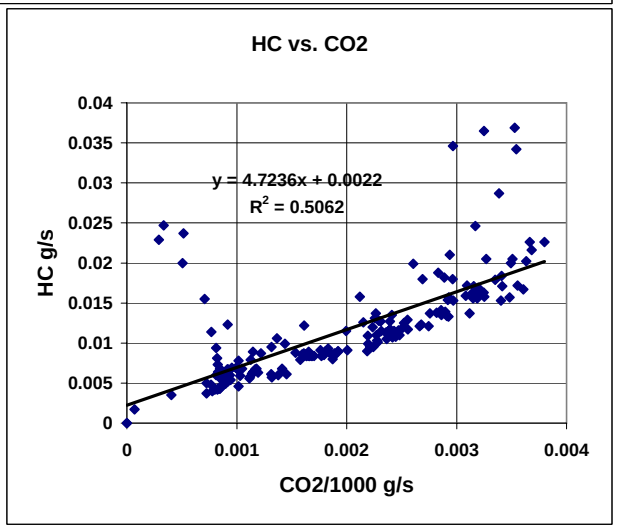
Ref: 59				**Leak predicted:**	No
Cert: 3031654	**VIN:** 1G2JB11K7K7590345		**Make:** PONT		
Year: 1989	**Model:** SUNBIR			**HC g/mi:**	1.89
	HCLP: Yes			**CO g/mi:**	8.02
	Note: response at filler neck				

Avg HC when CO2 low g/s:	0.007	**Stdev %:**	66%	**Avg HC-$HC_{CO:}$**	0.005		
HC vs. CO:	**A:** 1.31	**B:**	0.005	**R^2:**	0.48	**Stdev HC-$HC_{CO:}$**	0.005
HC vs. CO2	**A:** 4.72	**B:**	0.002	**R^2:**	0.51	**Stdev HC-$HC_{CO2:}$**	0.004



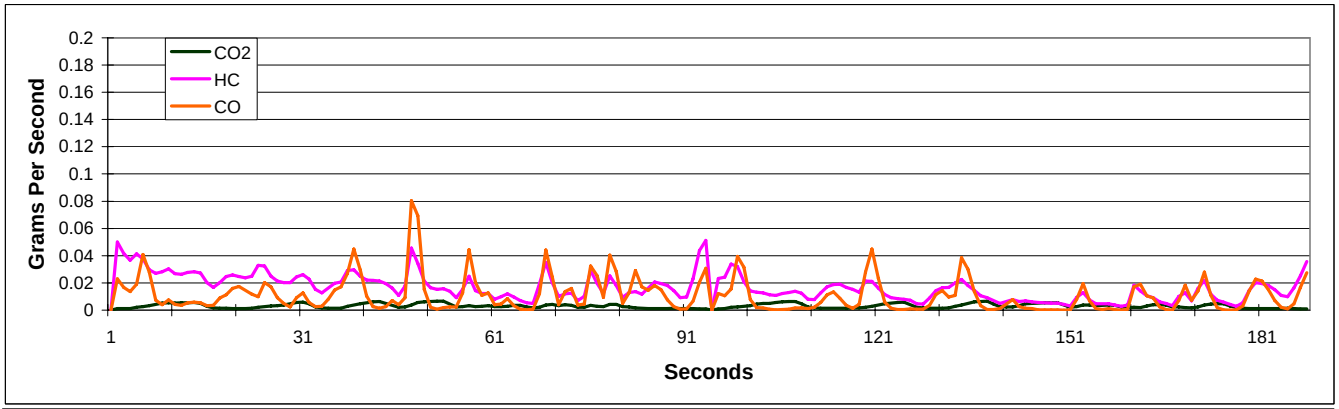


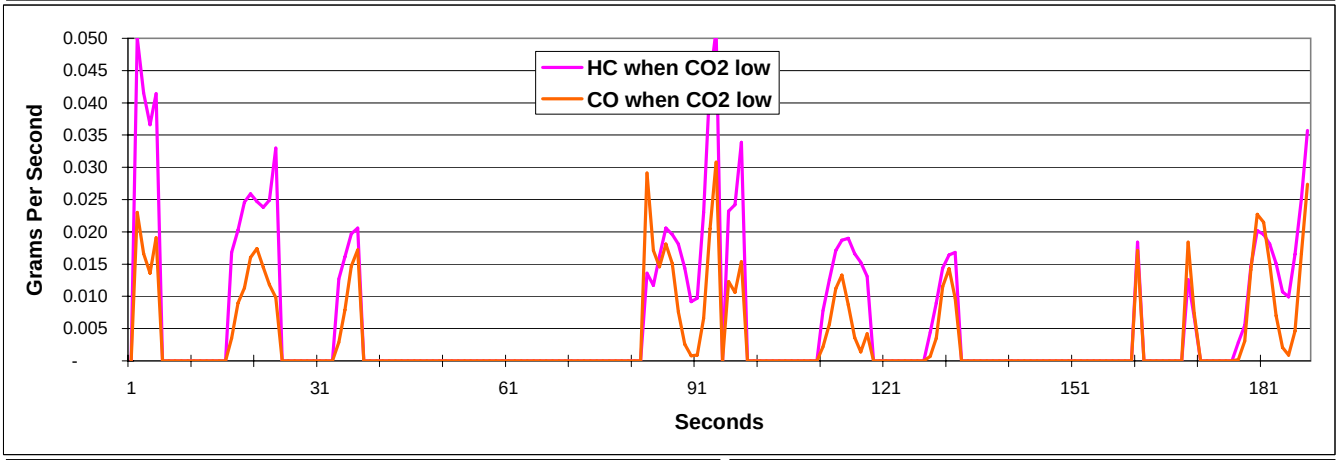


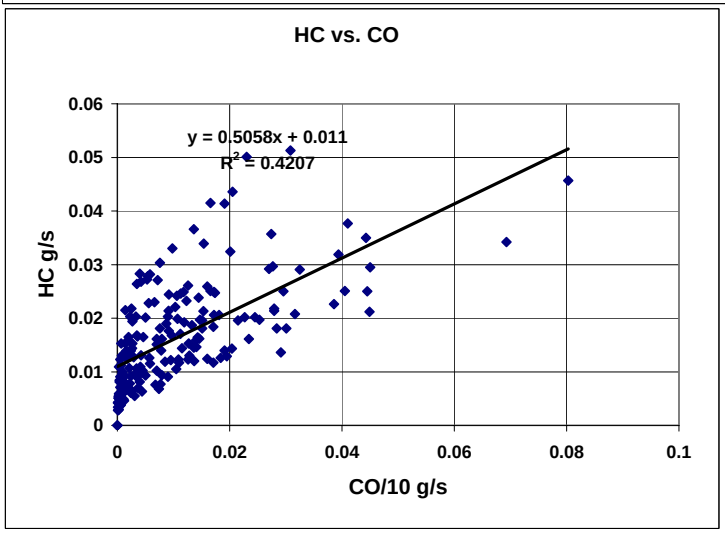


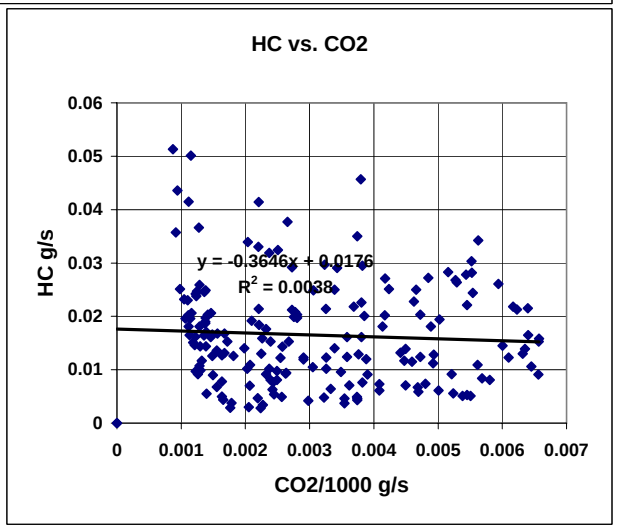
Ref:	**60**			**Leak predicted:**	**Yes**
Cert:	**3029654**	**VIN:**	**2GDEG25Z0P4511284**	**Make:**	**GMC**
Year:	**1993**	**Model:**	**G2500**	**HC g/mi:**	**2.76**
		HCLP:	**No**	**CO g/mi:**	**18.17**
		Note:	**0**		

Avg HC when CO2 low g/s:		**0.018**	**Stdev %:**	**51%**	**Avg HC-$HC_{CO:}$**	**0.011**	
HC vs. CO:	**A:**	**0.51**	**B:**	**0.011**	**R^2:**	**0.42**	**Stdev HC-$HC_{CO:}$** **0.007**
HC vs. CO2	**A:**	**(0.36)**	**B:**	**0.018**	**R^2:**	**0.00**	**Stdev HC-$HC_{CO2:}$** **0.009**



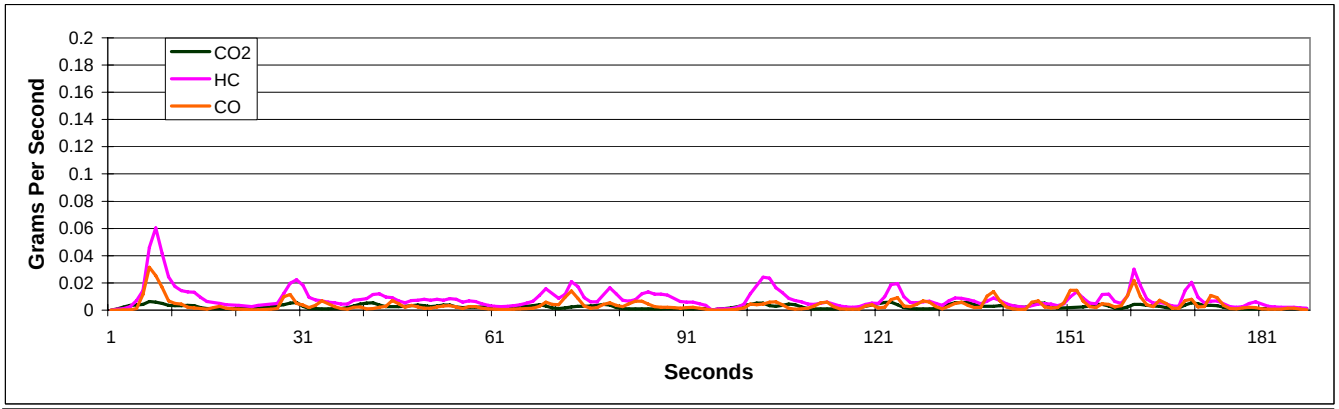


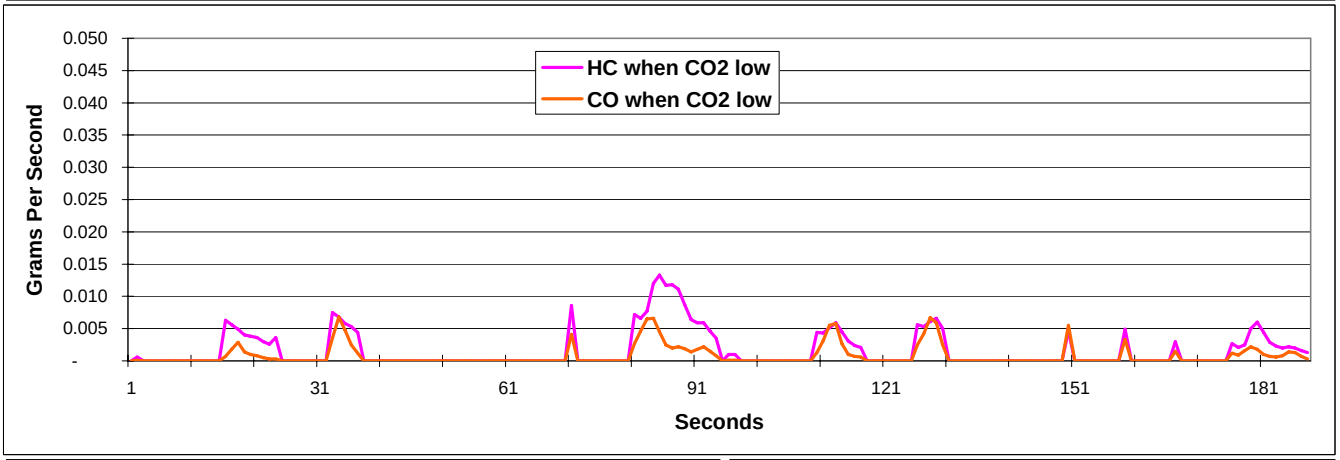


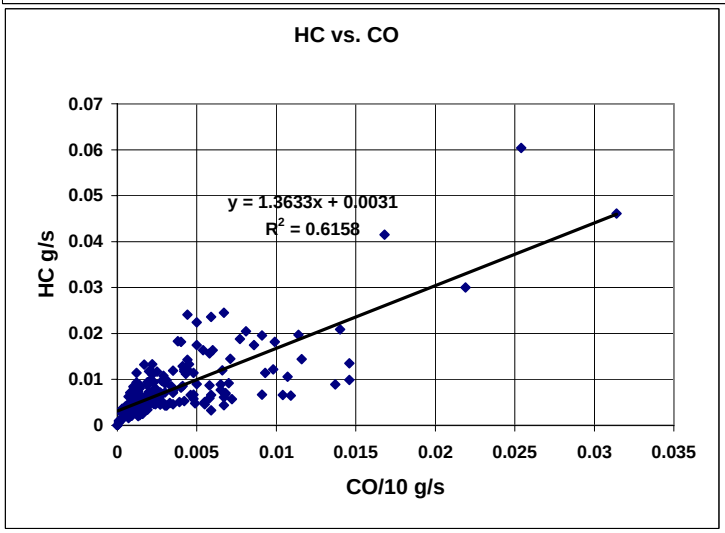


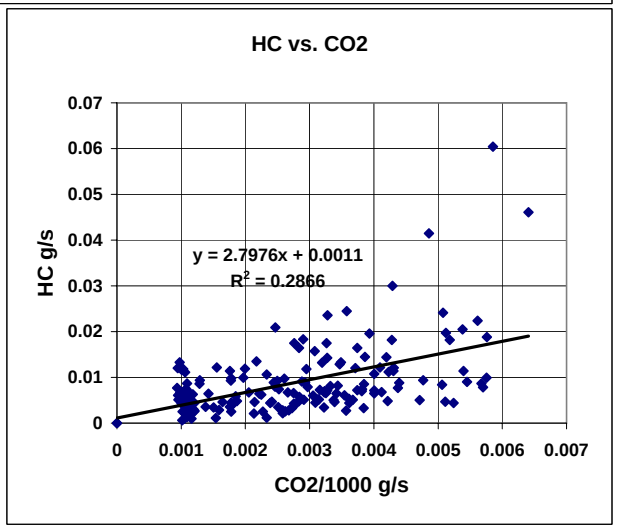
Ref: 61				**Leak predicted:**	No
Cert: 3031682	**VIN:** 1LNLM81W1PY603064		**Make:** LINC		
Year: 1993	**Model:** TOWN C			**HC g/mi:**	1.36
	HCLP: No			**CO g/mi:**	6.18
	Note: 0				

Avg HC when CO2 low g/s:		**0.005**	**Stdev %:**	**57%**	**Avg HC-HC_{CO_2}:**	**0.003**	
HC vs. CO:	**A:**	**1.36**	**B:**	**0.003**	**R^2:**	**0.62**	**Stdev HC-HC_{CO_2}:** **0.005**
HC vs. CO2	**A:**	**2.80**	**B:**	**0.001**	**R^2:**	**0.29**	**Stdev HC-HC_{CO_2}:** **0.006**



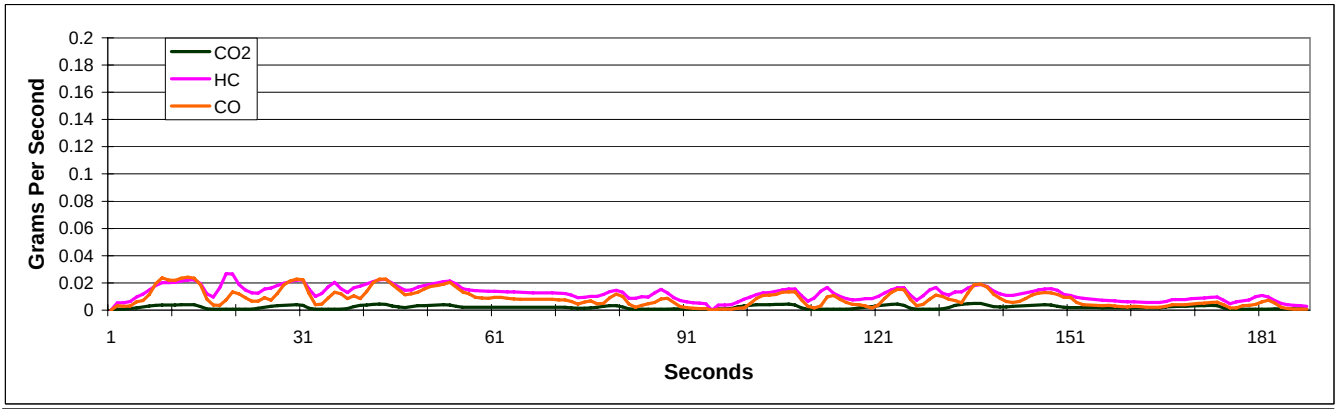


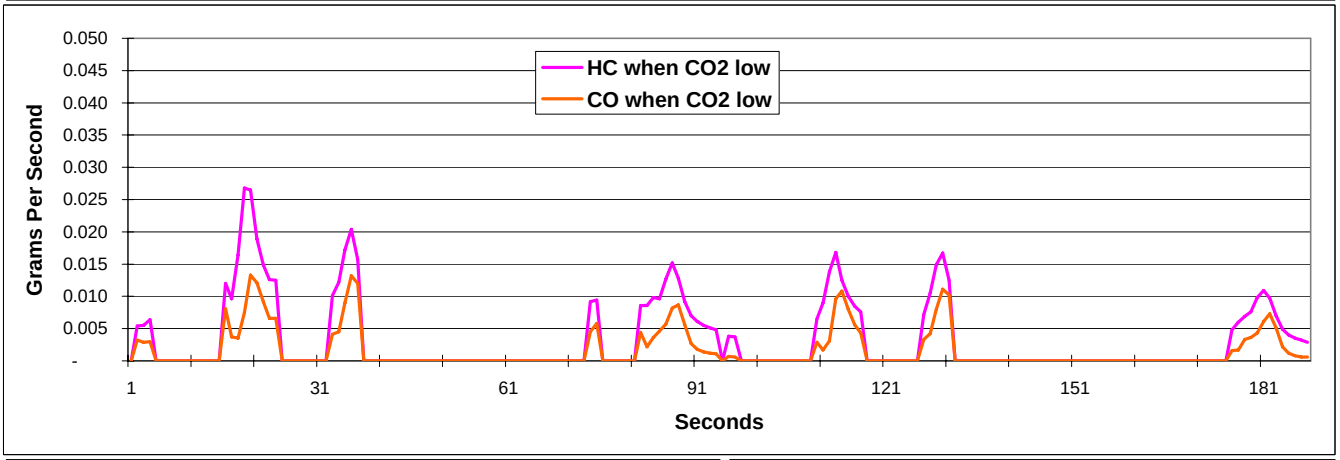


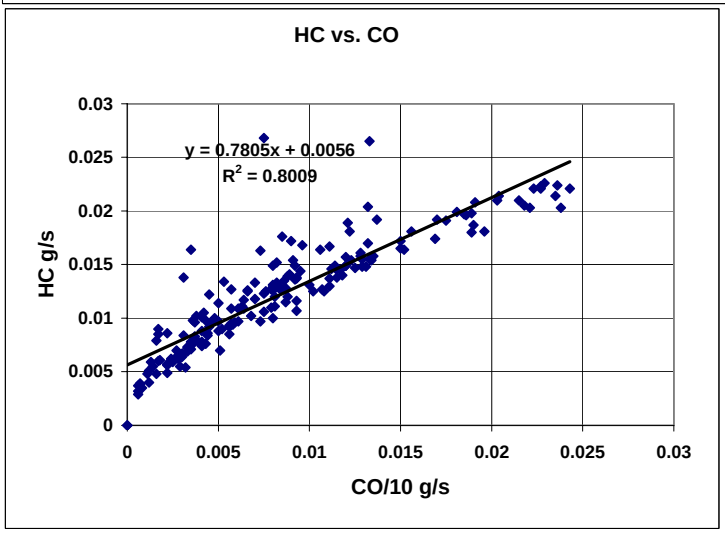


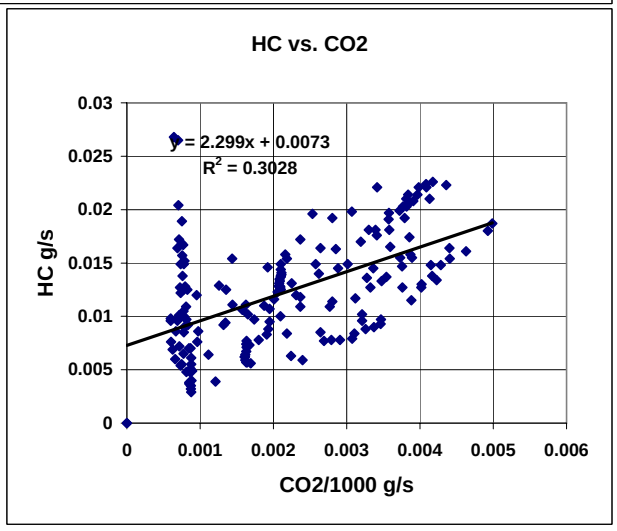
Ref:	**62**					**Leak predicted:**	**Yes**
Cert:	**3031685**	**VIN:**	**4M2DV11W9PDJ23028**	**Make:**	**MERC**		
Year:	**1993**	**Model:**	**VILLAG**		**HC g/mi:**	**2.05**	
		HCLP:	**Yes**		**CO g/mi:**	**14.17**	
		Note:	**LS of fuel tank**				

Avg HC when CO2 low g/s:		**0.010**	**Stdev %:**	**53%**	**Avg HC-HC$_{CO:}$**	**0.006**	
HC vs. CO:	**A:**	**0.78**	**B:**	**0.006**	**R^2:**	**0.80**	**Stdev HC-HC$_{CO:}$** **0.002**
HC vs. CO2	**A:**	**2.30**	**B:**	**0.007**	**R^2:**	**0.30**	**Stdev HC-HC$_{CO2:}$** **0.004**



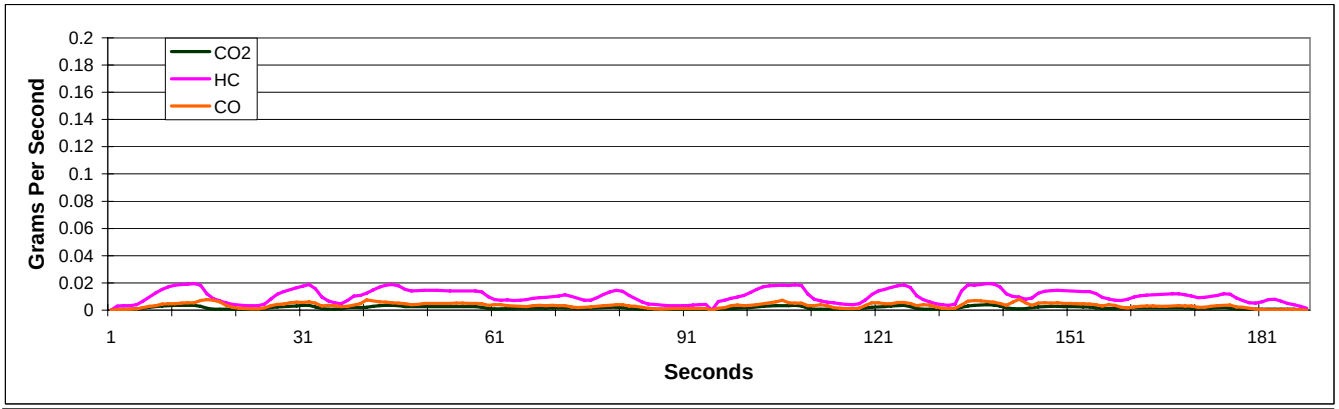


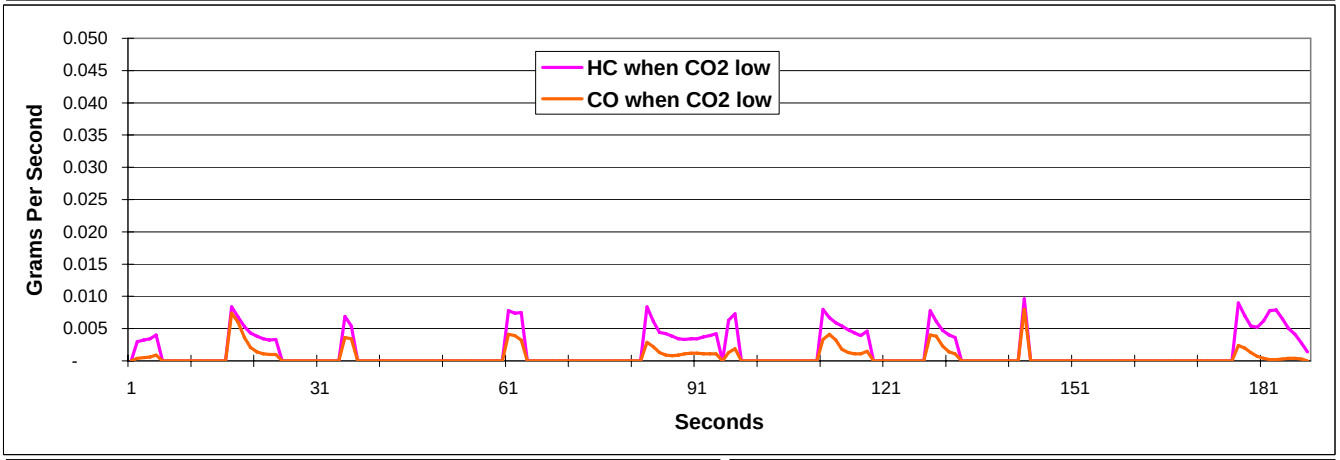


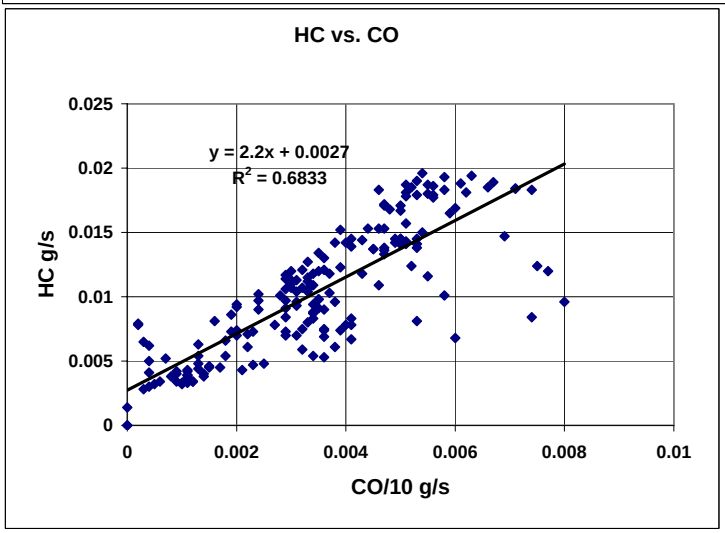


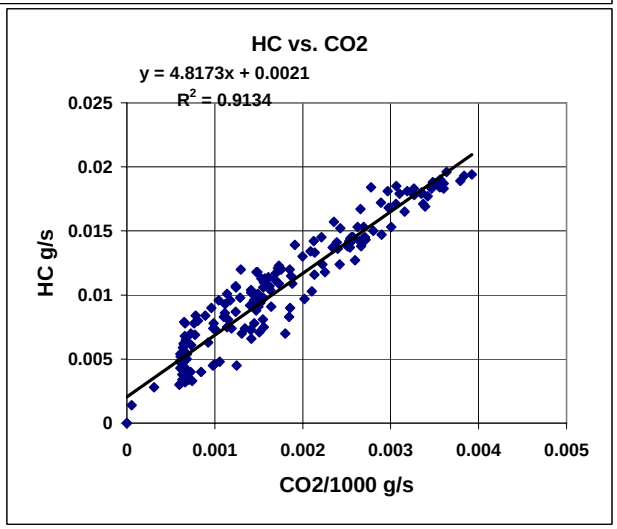
Ref: 63				**Leak predicted:**	No
Cert: 3029680	**VIN:** 1G1JC1242S7184216		**Make:** CHEV		
Year: 1995	**Model:** CAVALI			**HC g/mi:**	1.78
	HCLP: Yes			**CO g/mi:**	5.96
	Note: tank filler neck / at throttle body area				

Avg HC when CO2 low g/s:		**0.005**	**Stdev %:**	**38%**	**Avg HC-HC$_{CO2}$:**	**0.003**	
HC vs. CO:	**A:**	**2.20**	**B:**	**0.003**	**R^2:**	**0.68**	**Stdev HC-HC$_{CO2}$:** **0.003**
HC vs. CO2	**A:**	**4.82**	**B:**	**0.002**	**R^2:**	**0.91**	**Stdev HC-HC$_{CO2}$:** **0.001**



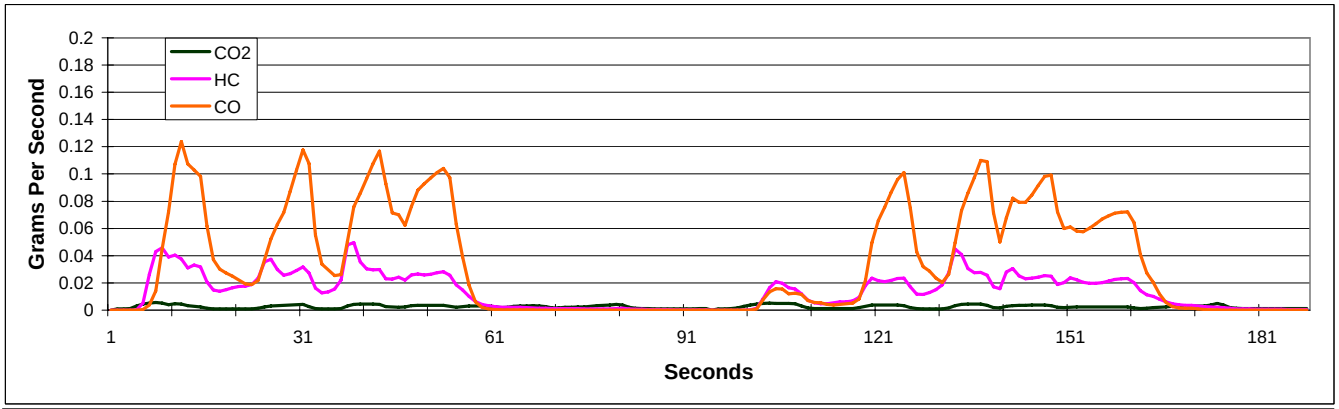


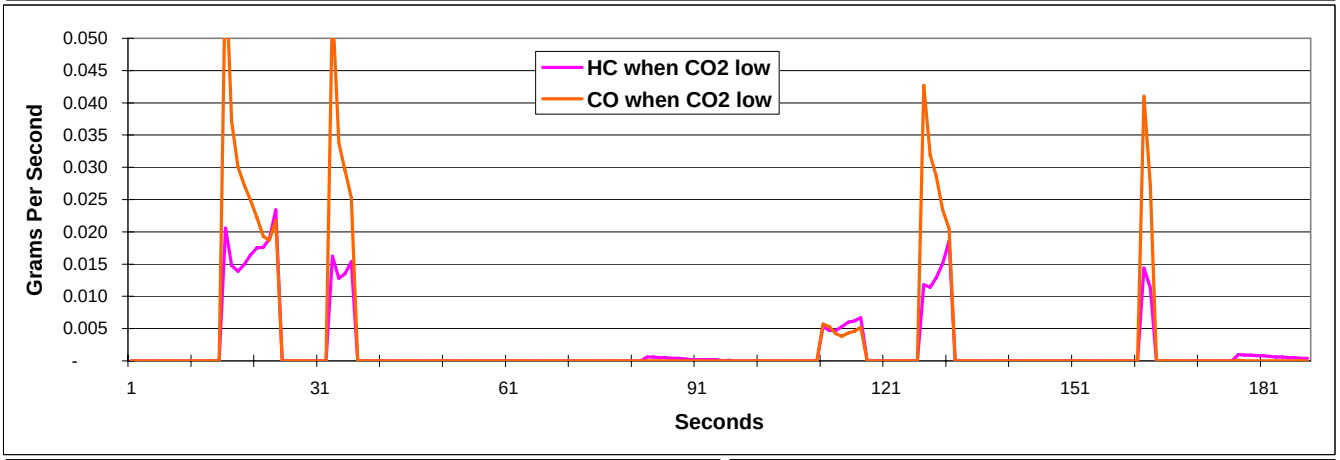


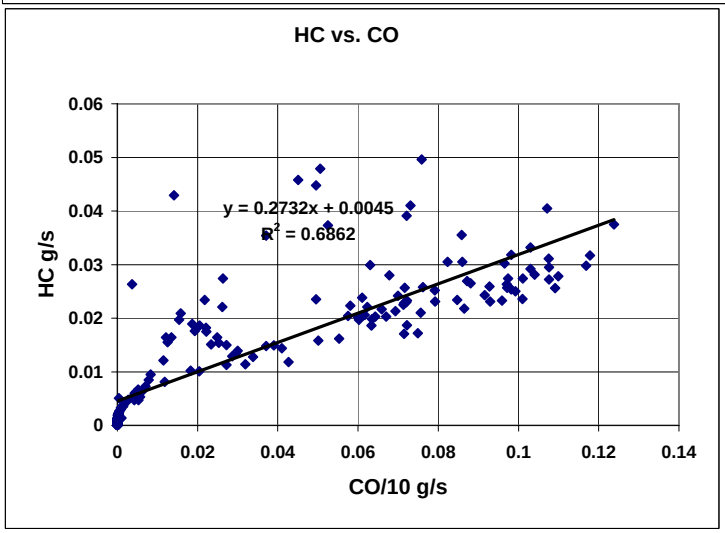


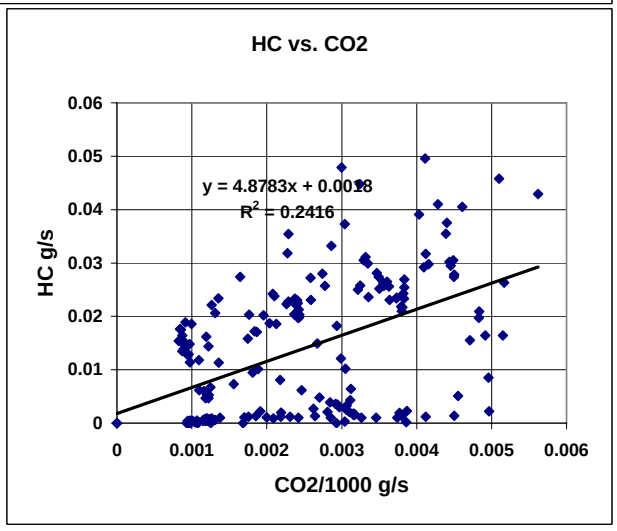
Ref:	**64**			**Leak predicted:**	**No**
Cert:	**3030017**	**VIN:**	**1MELM62W0SH634918**	**Make:**	**MERC**
Year:	**1995**	**Model:**	**COUGAR**	**HC g/mi:**	**2.32**
		HCLP:	**No**	**CO g/mi:**	**57.48**
		Note:	**0**		

Avg HC when CO2 low g/s:		**0.007**	**Stdev %:**	**111%**	**Avg HC-$HC_{CO:}$**	**0.005**	
HC vs. CO:	**A:**	**0.27**	**B:**	**0.005**	**R^2:**	**0.69**	**Stdev HC-$HC_{CO:}$** **0.007**
HC vs. CO2	**A:**	**4.88**	**B:**	**0.002**	**R^2:**	**0.24**	**Stdev HC-$HC_{CO2:}$** **0.011**



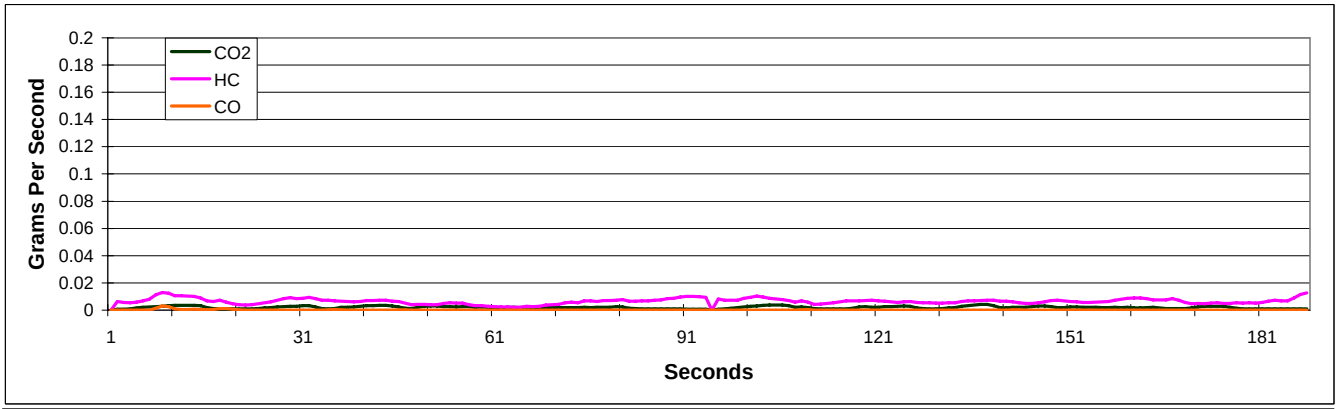


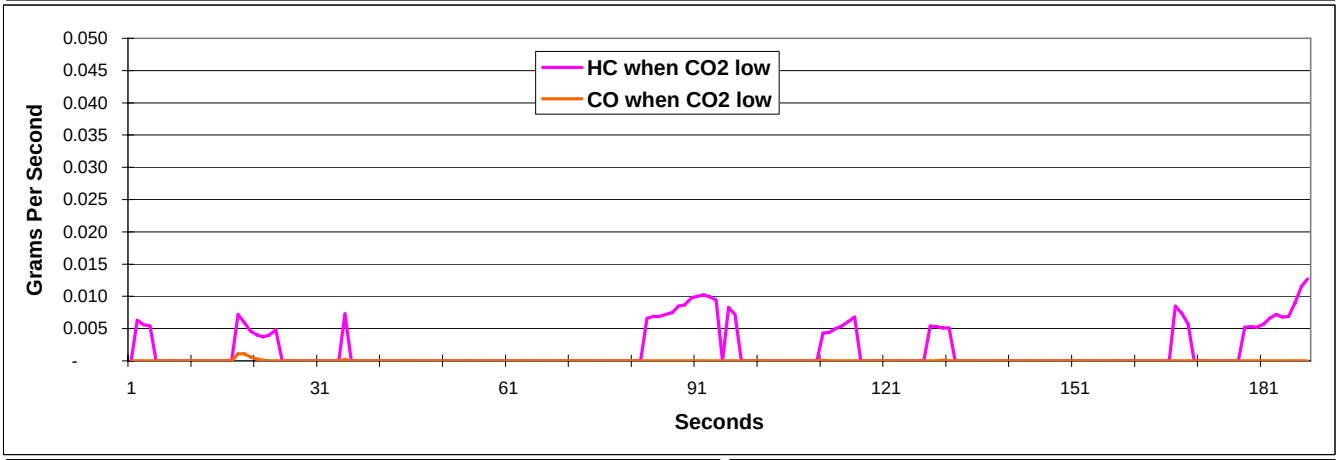


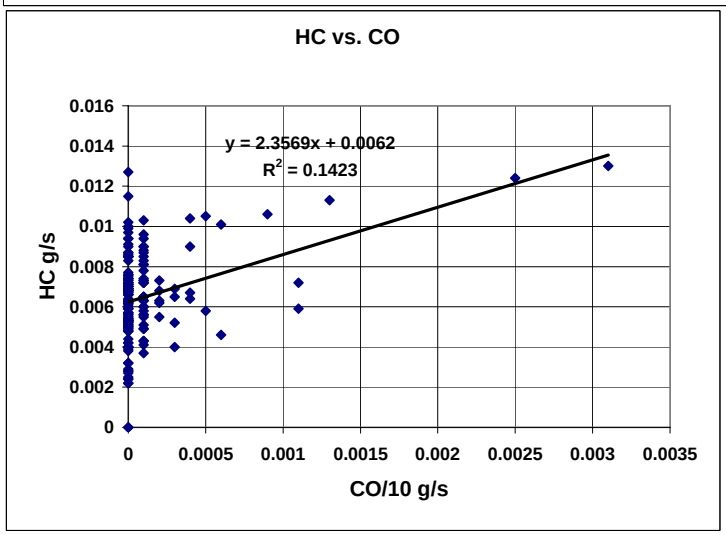


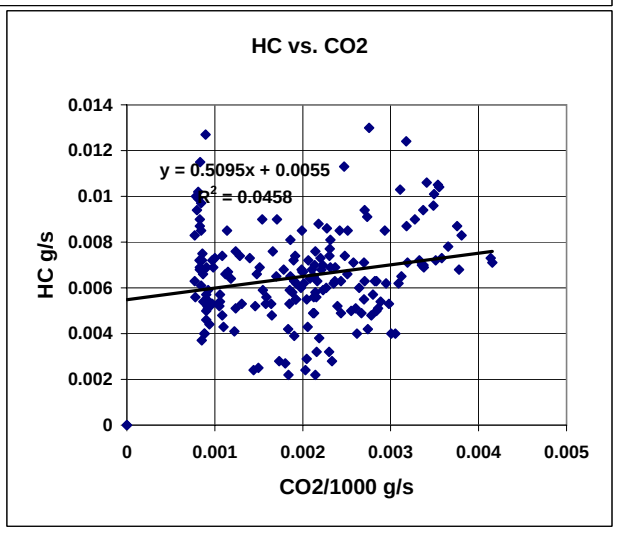
Ref: 65				**Leak predicted:**	Yes
Cert: 3029685	**VIN:** 1FAPP31X0PK126774		**Make:** FORD		
Year: 1993	**Model:** TEMPO			**HC g/mi:**	1.10
	HCLP: Yes			**CO g/mi:**	0.18
	Note: at tank fill / top of tank				

Avg HC when CO2 low g/s:	0.007	**Stdev %:**	34%	**Avg HC-$HC_{CO:}$**	0.006		
HC vs. CO:	**A:** 2.36	**B:**	0.006	**R^2:**	0.14	**Stdev HC-$HC_{CO:}$**	0.002
HC vs. CO2	**A:** 0.51	**B:**	0.005	**R^2:**	0.05	**Stdev HC-$HC_{CO2:}$**	0.002



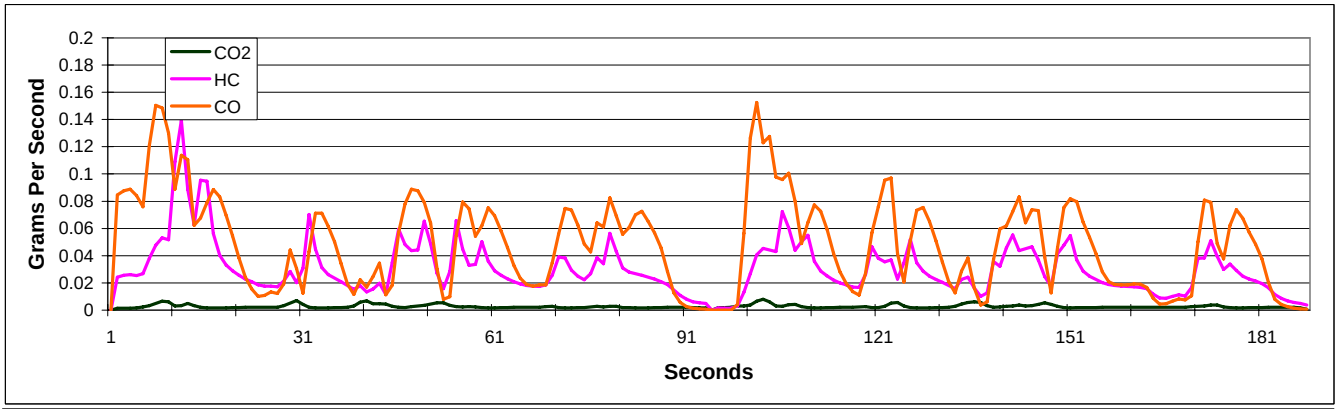


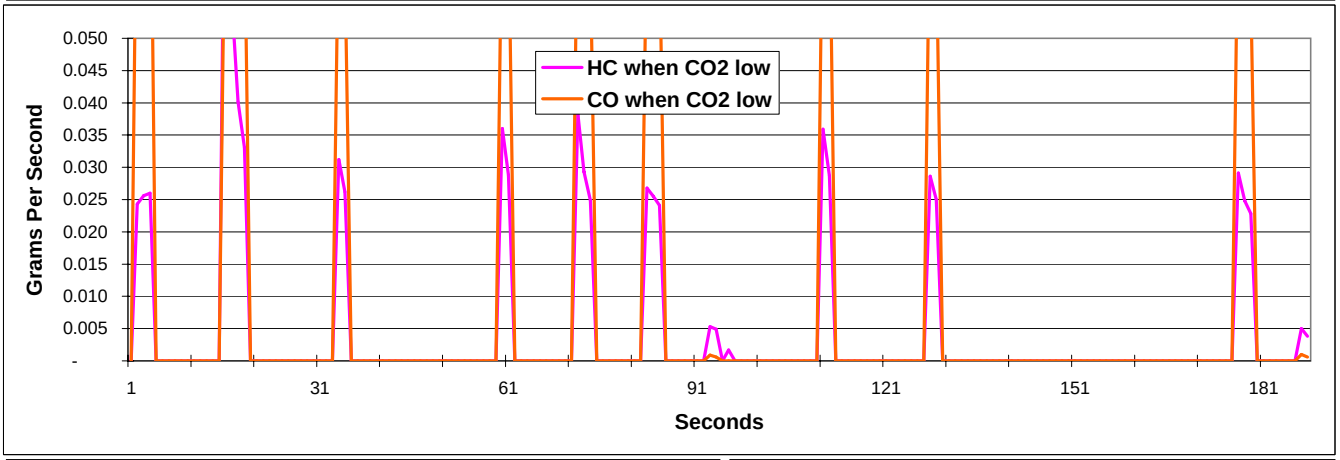


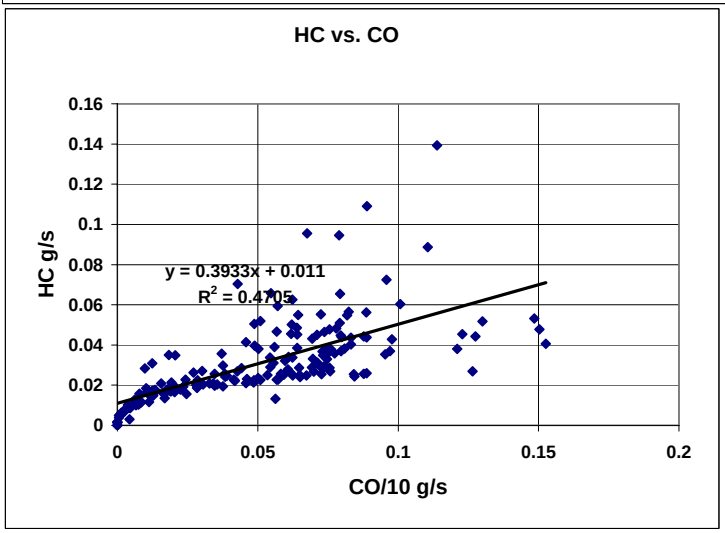


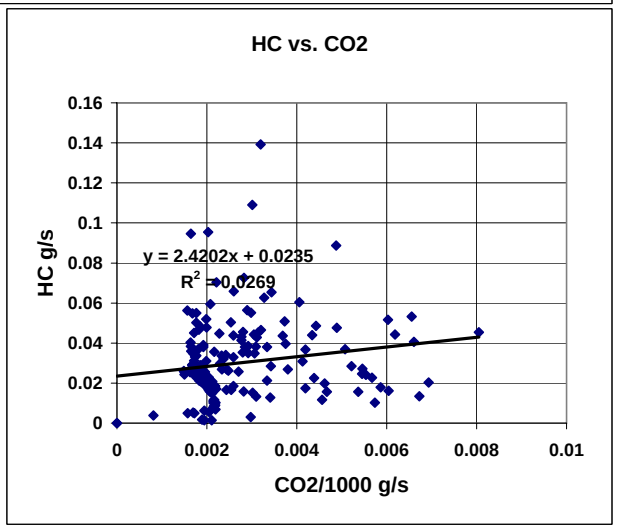
Ref:	**66**			**Leak predicted:**	**Yes**
Cert:	**2922718**	**VIN:**	**1G3WH54TXPD304282**	**Make:**	**OLDS**
Year:	**1993**	**Model:**	**CUTLAS**	**HC g/mi:**	**4.97**
		HCLP:	**No**	**CO g/mi:**	**80.08**
		Note:	**0**		

Avg HC when CO2 low g/s:		**0.027**	**Stdev %:**	**70%**	**Avg HC-$HC_{CO:}$**	**0.011**	
HC vs. CO:	**A:**	**0.39**	**B:**	**0.011**	**R^2:**	**0.47**	**Stdev HC-$HC_{CO:}$** **0.014**
HC vs. CO2	**A:**	**2.42**	**B:**	**0.023**	**R^2:**	**0.03**	**Stdev HC-$HC_{CO2:}$** **0.019**



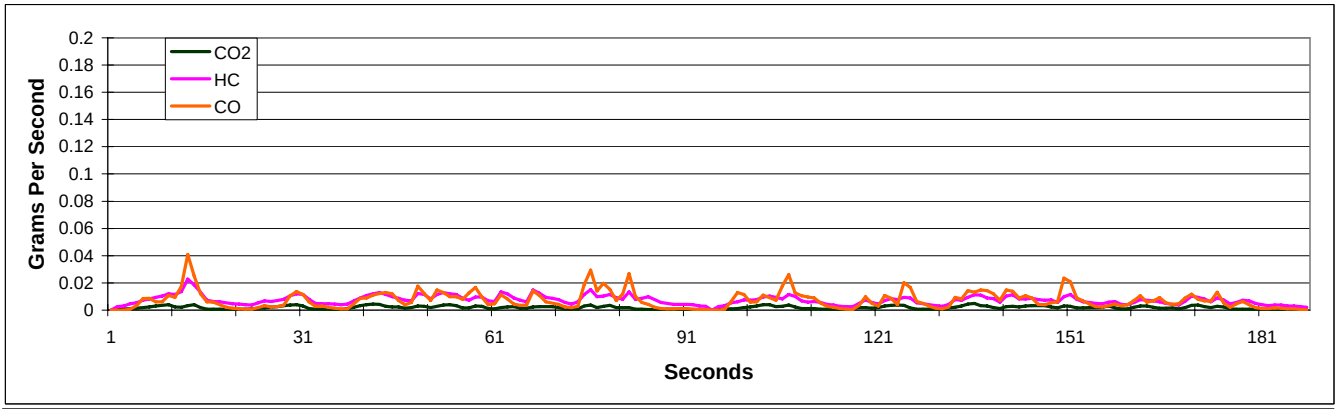


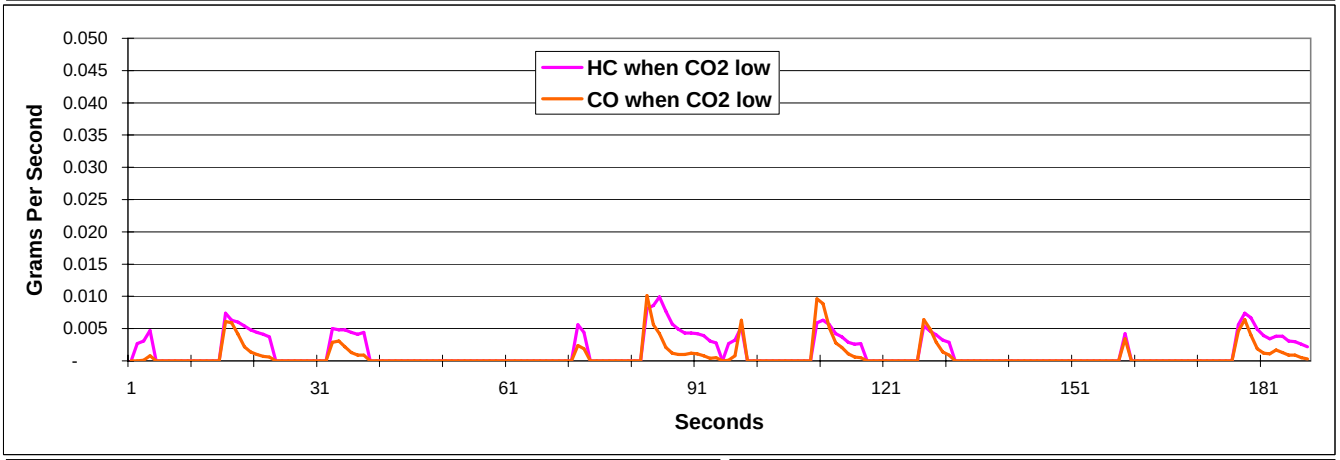


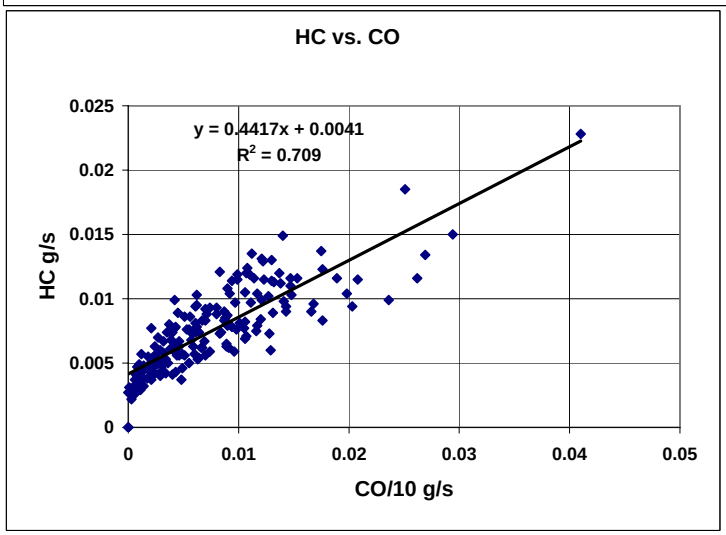


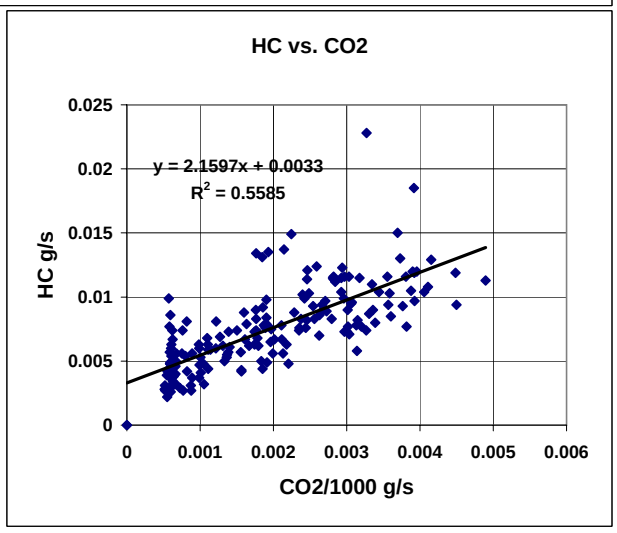
Ref: 67				**Leak predicted:**	No
Cert: 2910506	**VIN:** 1P3XP64K4PN671662		**Make:** PLYM		
Year: 1993	**Model:** SUNDAN			**HC g/mi:**	1.23
	HCLP: No			**CO g/mi:**	12.27
	Note: 0				

Avg HC when CO2 low g/s:		**0.005**	**Stdev %:**	**38%**	**Avg HC-$HC_{CO:}$**	**0.004**	
HC vs. CO:	**A:**	**0.44**	**B:**	**0.004**	**R^2:**	**0.71**	**Stdev HC-$HC_{CO:}$** **0.002**
HC vs. CO2	**A:**	**2.16**	**B:**	**0.003**	**R^2:**	**0.56**	**Stdev HC-$HC_{CO2:}$** **0.002**



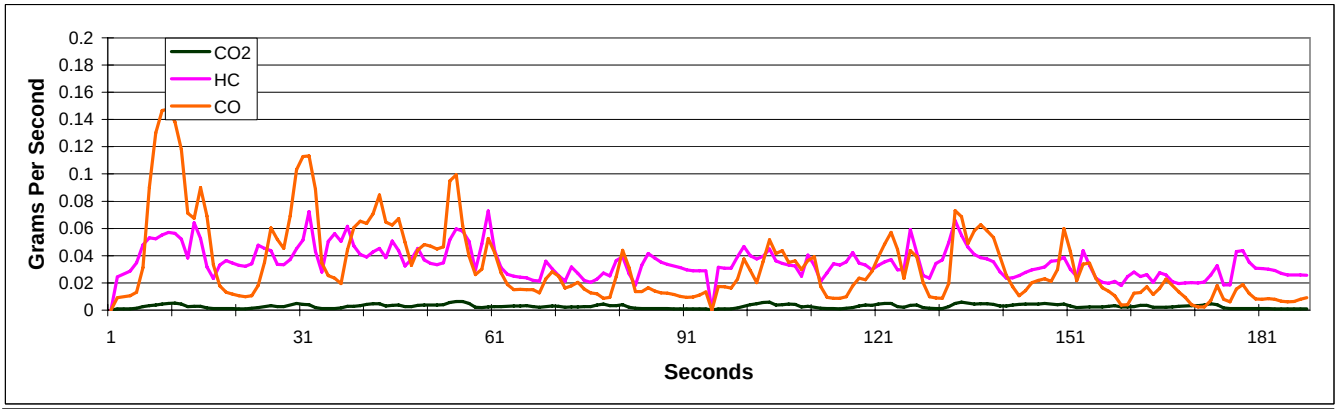


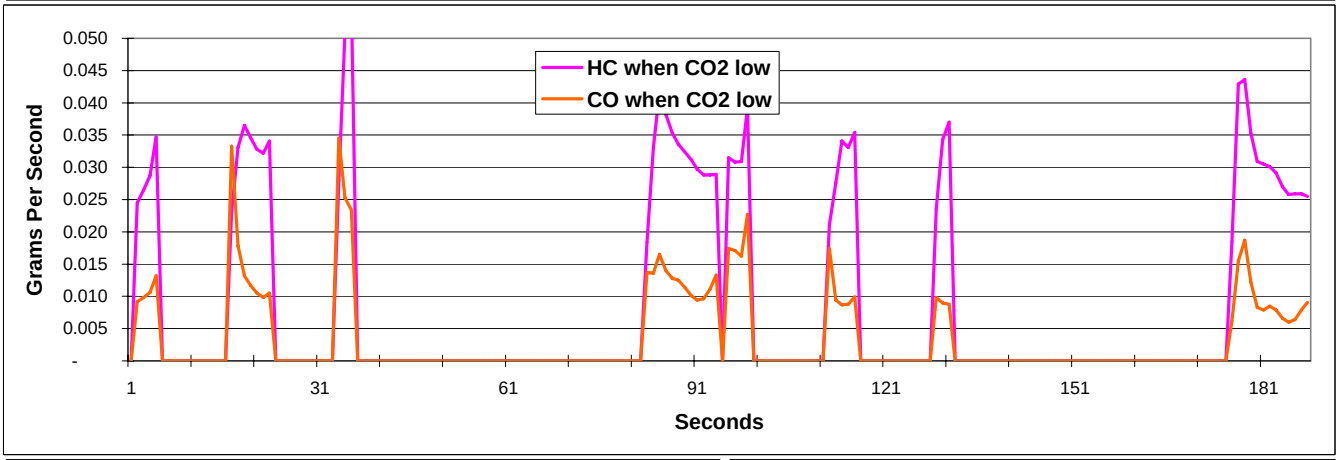


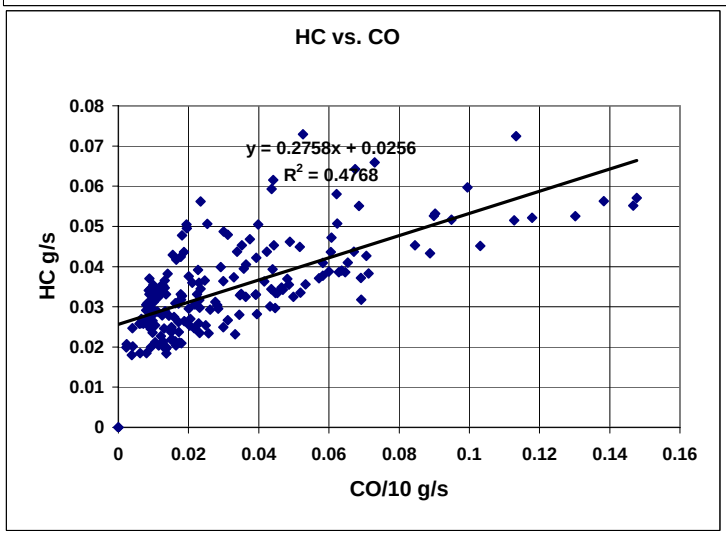


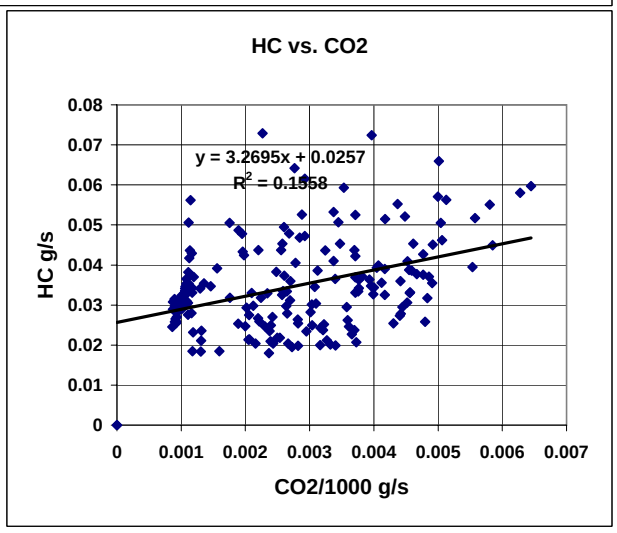
Ref: 68				Leak predicted:	Yes
Cert: 3030131	VIN: 1GCEG25H9D7148317		Make: CHEV		
Year: 1983	Model: G20 V		HC g/mi:	5.91	
	HCLP: No		CO g/mi:	56.00	
	Note: 0				

Avg HC when CO2 low g/s:	0.031	Stdev %:	27%	Avg HC-$HC_{CO:}$	0.026		
HC vs. CO:	A:	0.28	B:	0.026	R^2:	0.48	Stdev HC-$HC_{CO:}$	0.008
HC vs. CO2	A:	3.27	B:	0.026	R^2:	0.16	Stdev HC-$HC_{CO2:}$	0.011



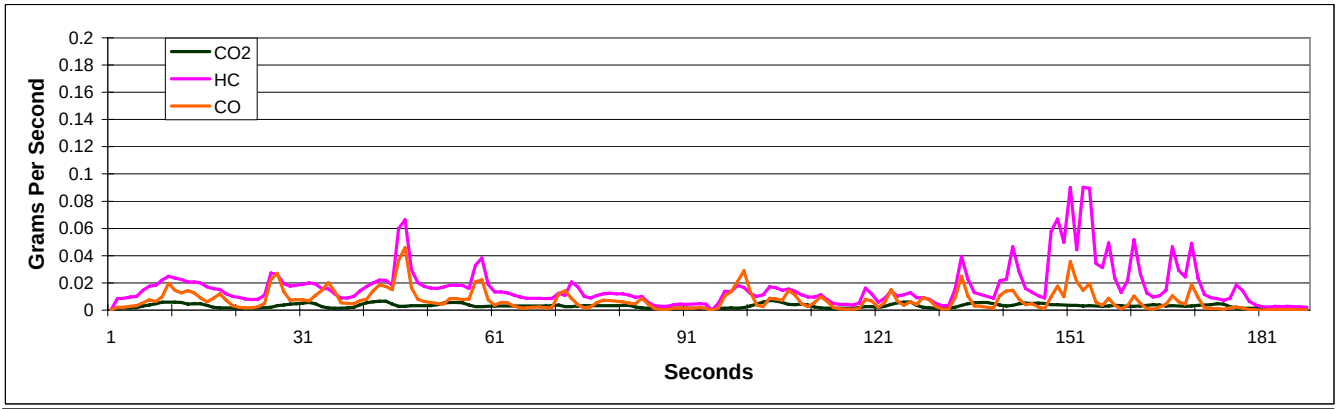


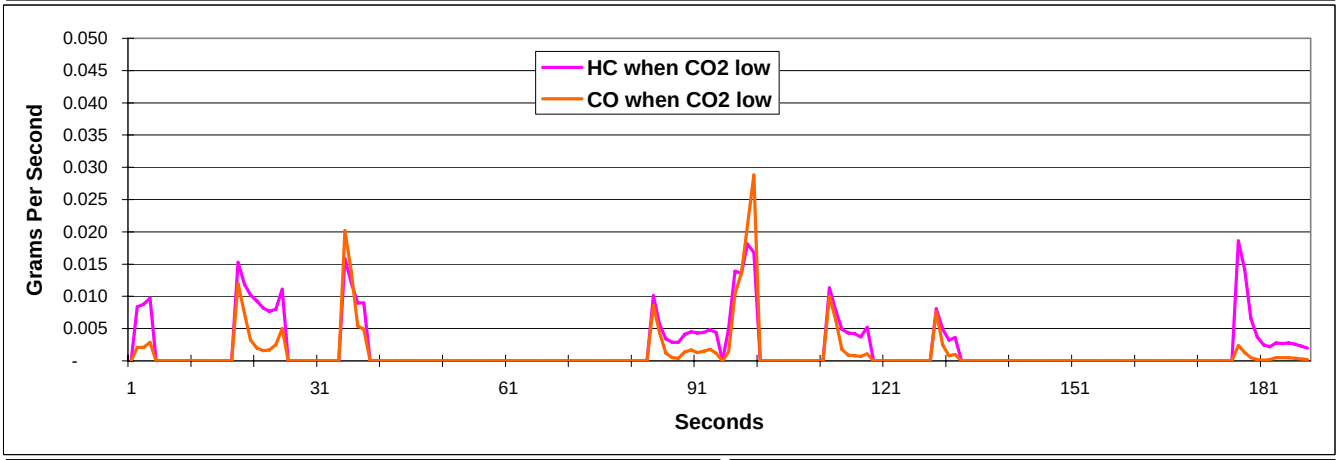


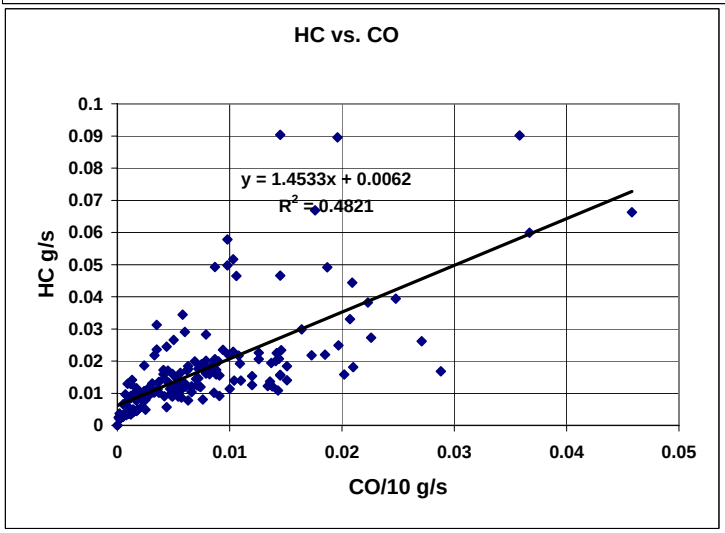


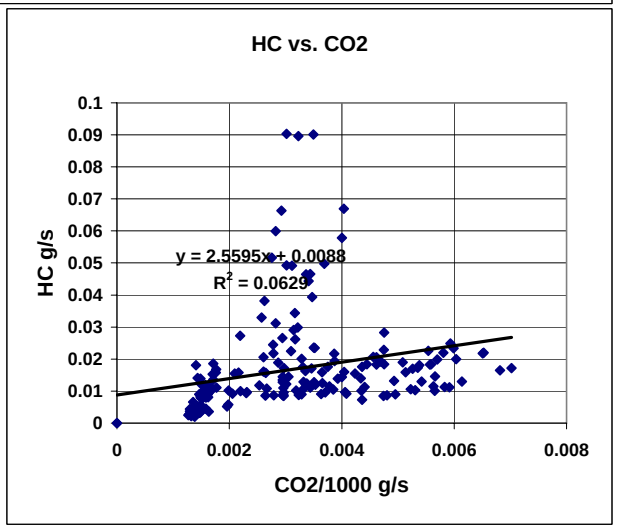
Ref: 69				**Leak predicted:** Yes	
Cert: 3030132	**VIN:** 1FTDF15Y6SLA74948		**Make:** FORD		
Year: 1995	**Model:** F150 R		**HC g/mi:**	2.87	
	HCLP: Yes		**CO g/mi:**	12.54	
	Note: filler neck				

Avg HC when CO2 low g/s:		0.007	**Stdev %:**	66%	**Avg HC-HC_{CO2}:**	0.006	
HC vs. CO:	**A:**	1.45	**B:**	0.006	**R^2:**	0.48	**Stdev HC-HC_{CO2}:** 0.011
HC vs. CO2	**A:**	2.56	**B:**	0.009	**R^2:**	0.06	**Stdev HC-HC_{CO2}:** 0.015



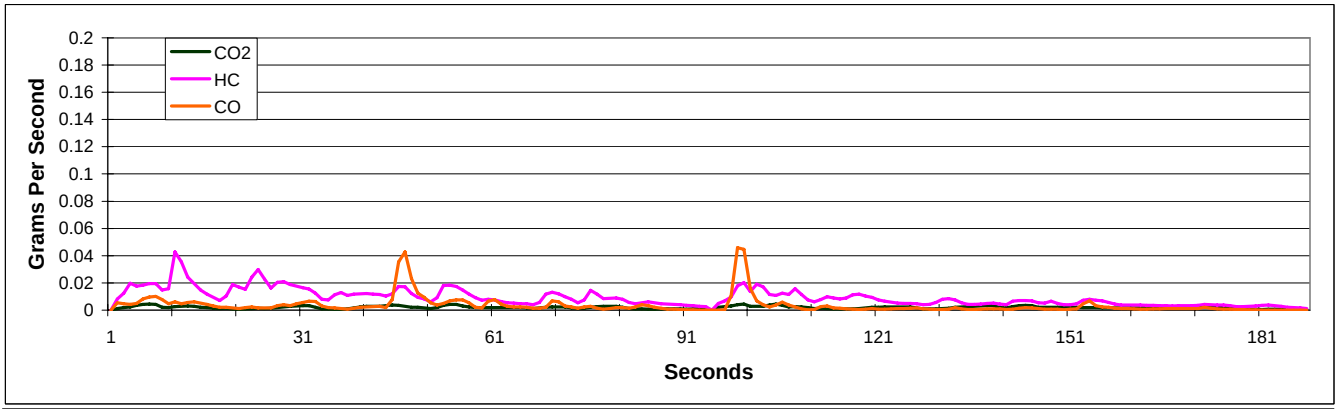


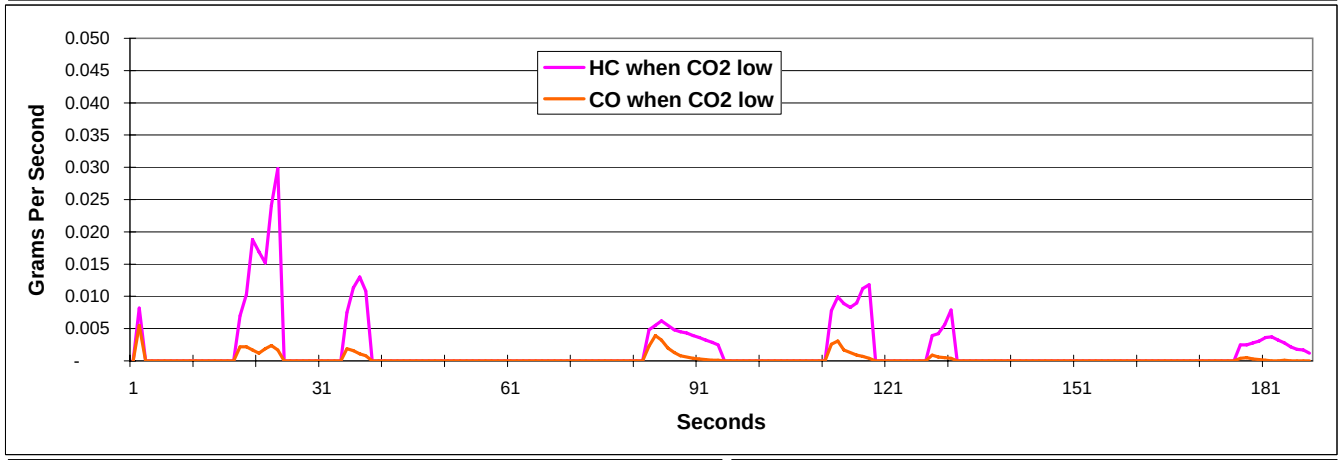


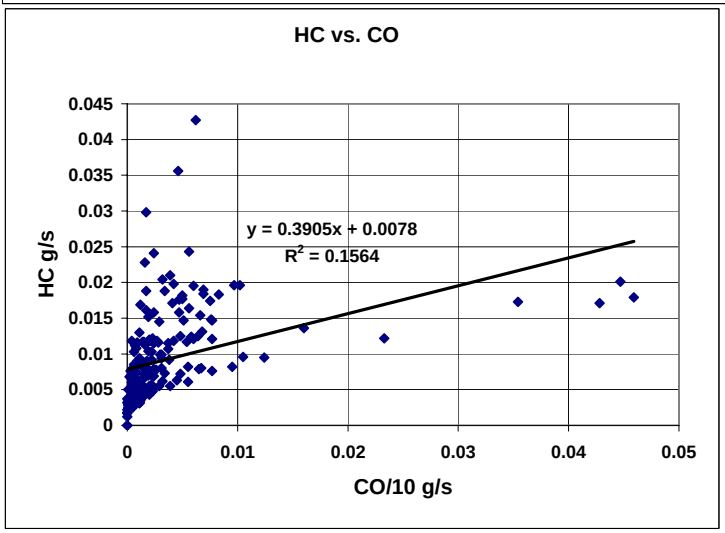


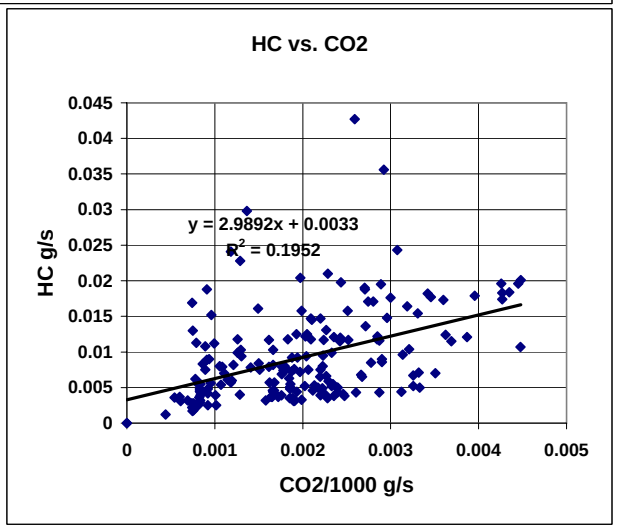
Ref: 70				**Leak predicted:**	No
Cert: 3030134	**VIN:** 4A3AK44Y1SE129275		**Make:** MITS		
Year: 1995	**Model:** ECLIPS			**HC g/mi:**	1.59
	HCLP: Yes			**CO g/mi:**	6.03
	Note: top of fuel tank RR				

Avg HC when CO2 low g/s:		0.007	**Stdev %:**	84%	**Avg HC-$HC_{CO:}$**	0.008	
HC vs. CO:	**A:**	0.39	**B:**	0.008	**R^2:**	0.16	**Stdev HC-$HC_{CO:}$** 0.006
HC vs. CO2	**A:**	2.99	**B:**	0.003	**R^2:**	0.20	**Stdev HC-$HC_{CO2:}$** 0.006



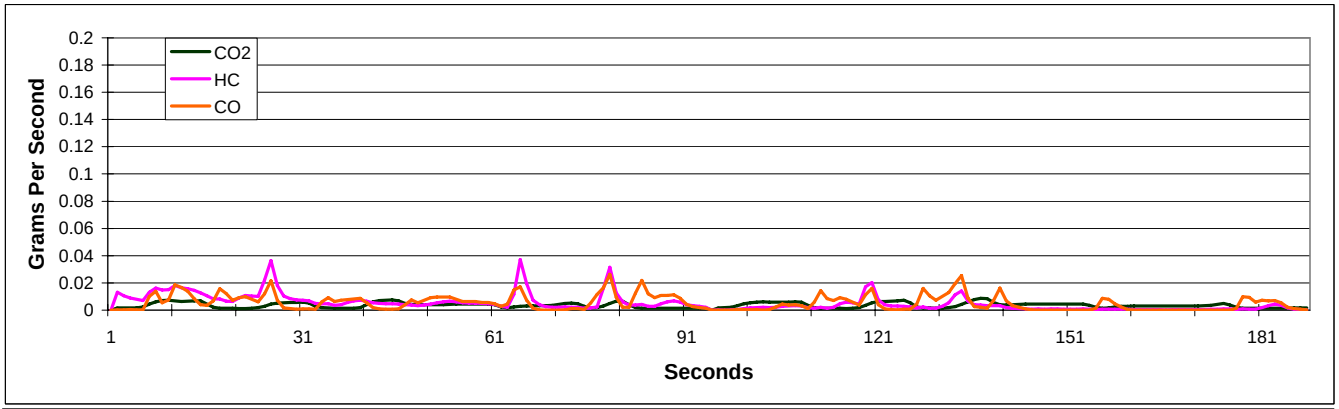


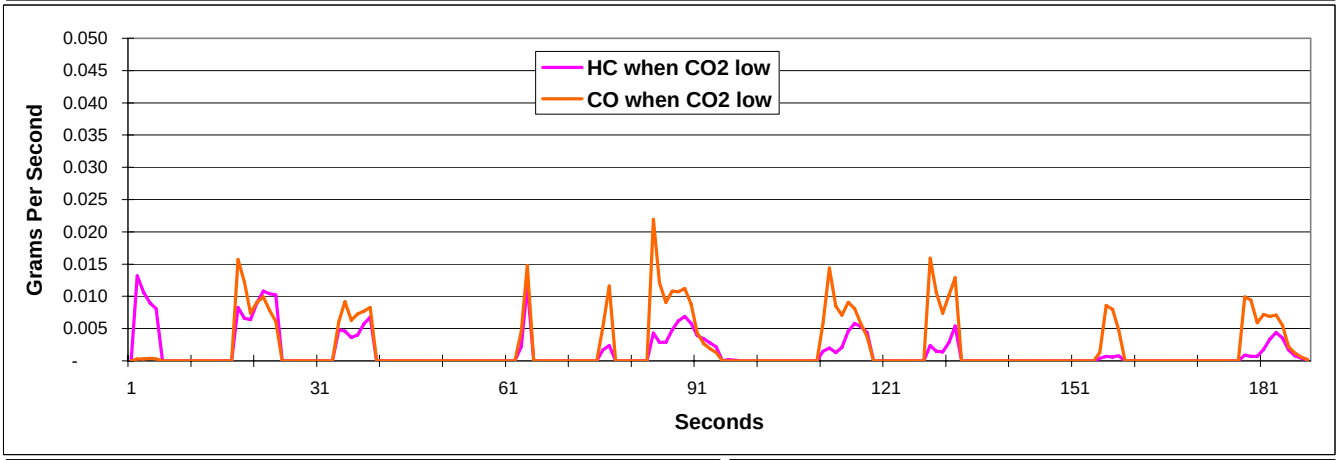


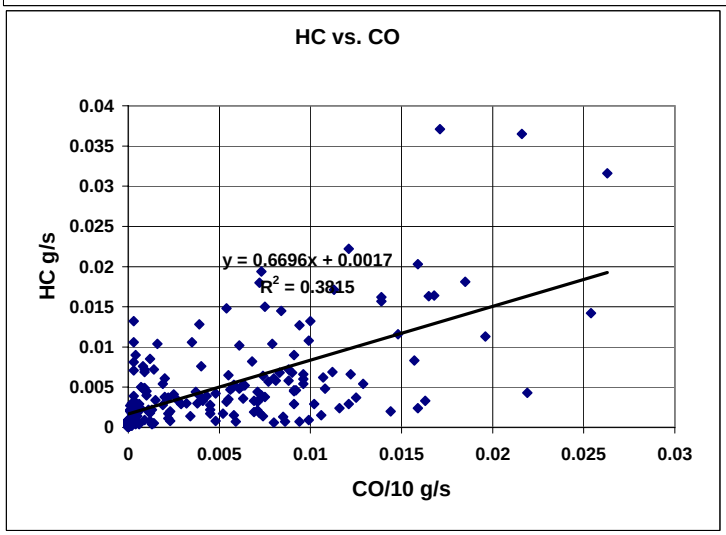


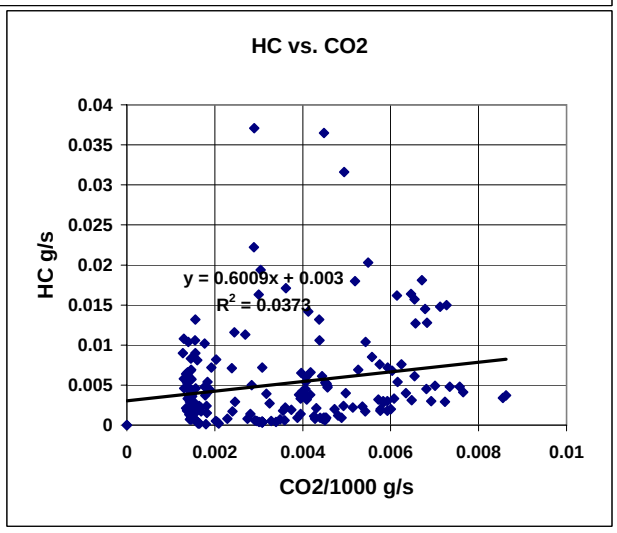
Ref: 72						**Leak predicted:**	No
Cert: 2922592	**VIN:** 1FTEX15Y6SKA22727			**Make:** FORD			
Year: 1995	**Model:** F150 S				**HC g/mi:**	0.86	
	HCLP: Yes				**CO g/mi:**	8.74	
	Note: fuel tank top						

Avg HC when CO2 low g/s:		0.004	**Stdev %:**	80%	**Avg HC-$HC_{CO:}$**	0.002	
HC vs. CO:	**A:**	0.67	**B:**	0.002	**R^2:**	0.38	**Stdev HC-$HC_{CO:}$** 0.005
HC vs. CO2	**A:**	0.60	**B:**	0.003	**R^2:**	0.04	**Stdev HC-$HC_{CO2:}$** 0.006



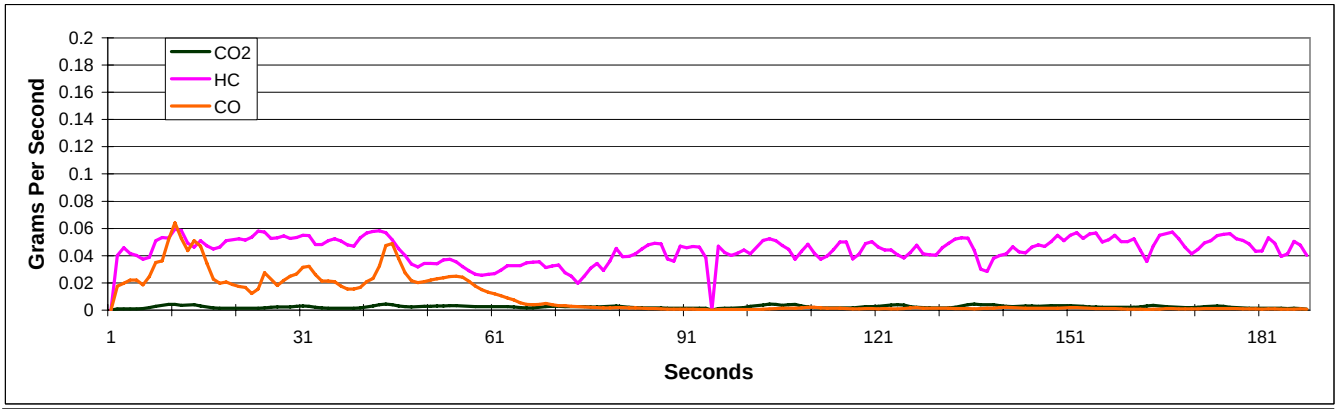


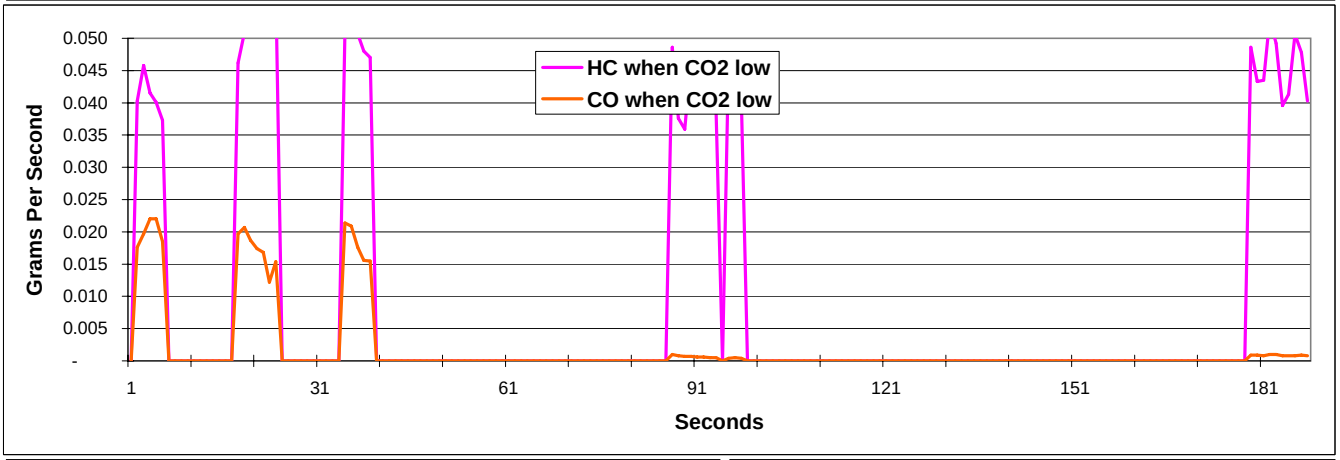


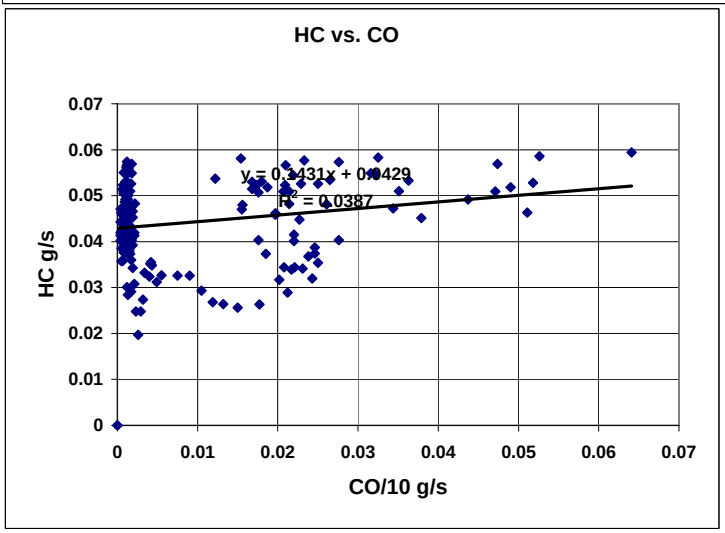


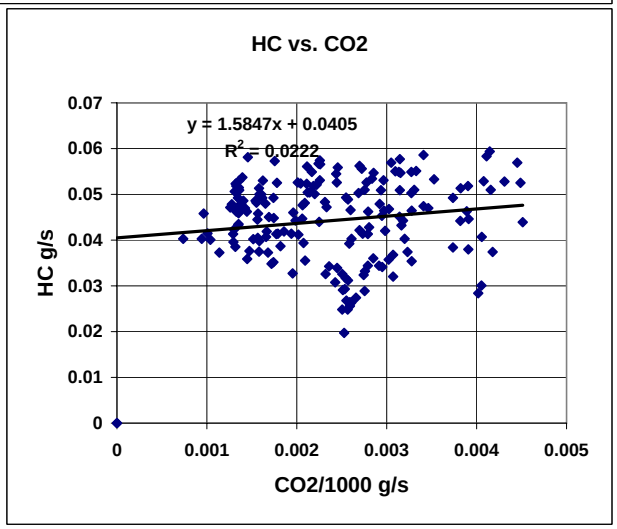
Ref: 73				**Leak predicted:**	Yes
Cert: 3035887	**VIN:** 2G1FP22P6S2158493		**Make:** CHEV		
Year: 1995	**Model:** CAMARO			**HC g/mi:**	7.39
	HCLP: Yes			**CO g/mi:**	15.70
	Note: fuel tank top				

Avg HC when CO2 low g/s:	0.045	**Stdev %:**	21%	**Avg HC-$HC_{CO:}$**	0.043		
HC vs. CO:	**A:** 0.14	**B:**	0.043	**R^2:**	0.04	**Stdev HC-$HC_{CO:}$**	0.009
HC vs. CO2	**A:** 1.58	**B:**	0.040	**R^2:**	0.02	**Stdev HC-$HC_{CO2:}$**	0.009



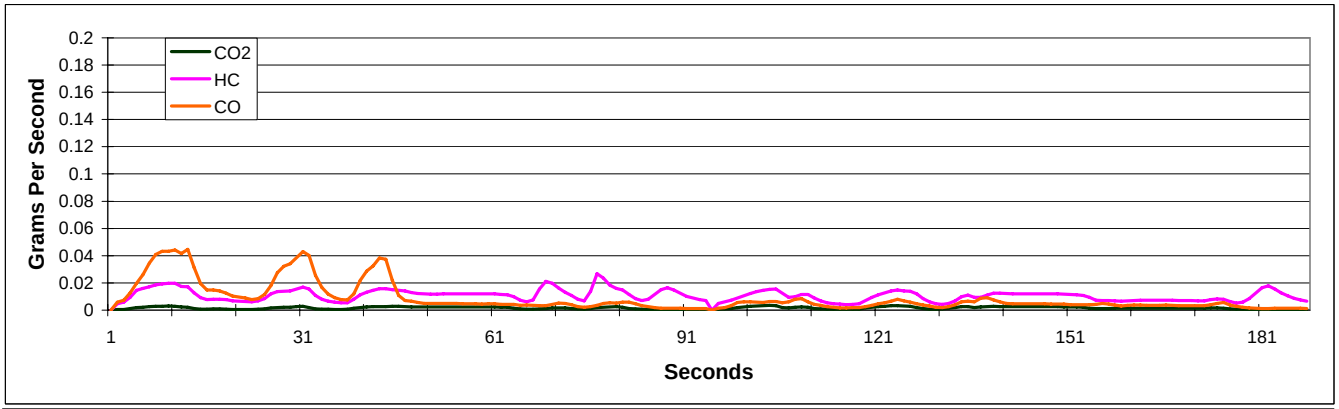


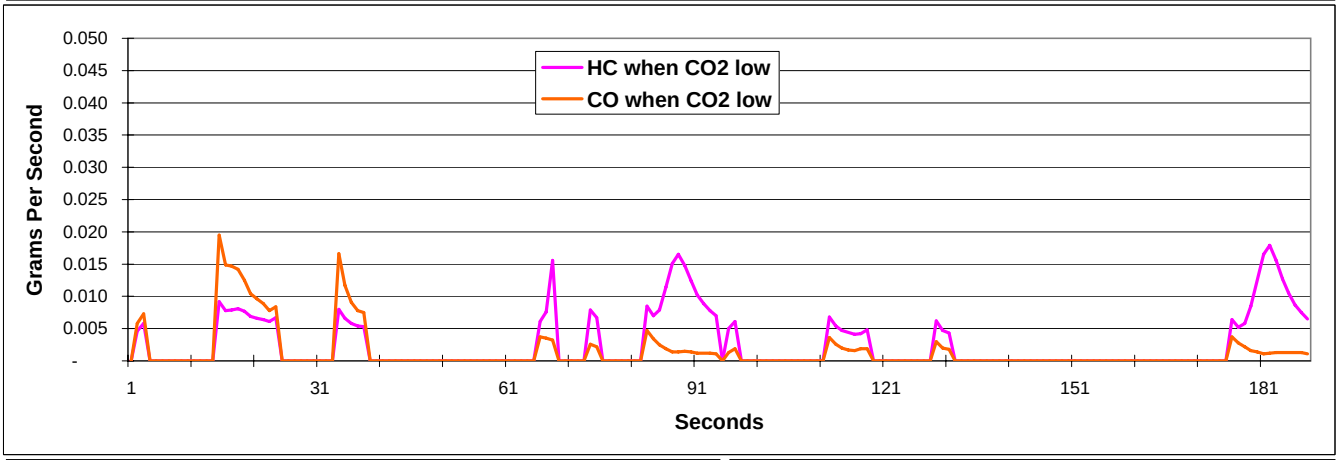


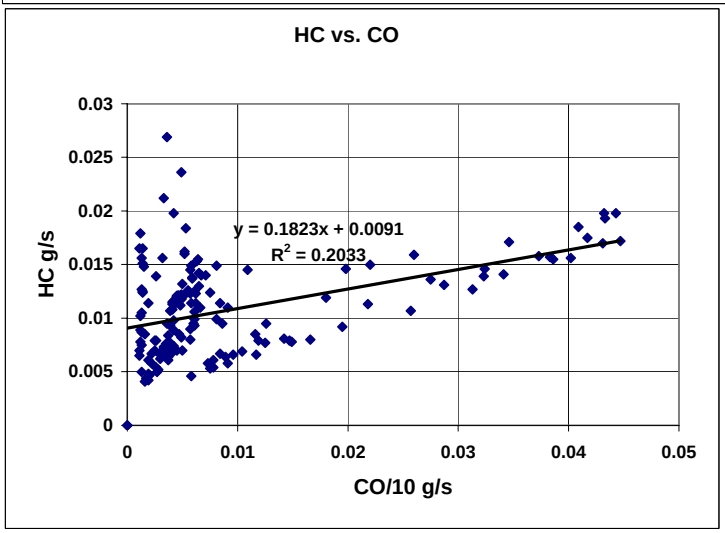


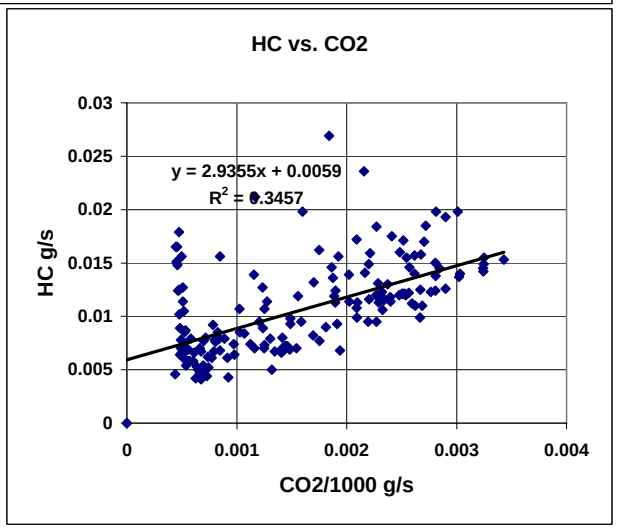
Ref: 74				**Leak predicted:**	No
Cert: 2906999	**VIN:** 1G1JC5245S7204479		**Make:** CHEV		
Year: 1995	**Model:** CAVALI			**HC g/mi:**	1.77
	HCLP: No			**CO g/mi:**	14.22
	Note: 0				

Avg HC when CO2 low g/s:	0.008	**Stdev %:**	45%	**Avg HC-$HC_{CO:}$**	0.009		
HC vs. CO:	**A:** 0.18	**B:**	0.009	**R^2:**	0.20	**Stdev HC-$HC_{CO:}$**	0.004
HC vs. CO2	**A:** 2.94	**B:**	0.006	**R^2:**	0.35	**Stdev HC-$HC_{CO2:}$**	0.003



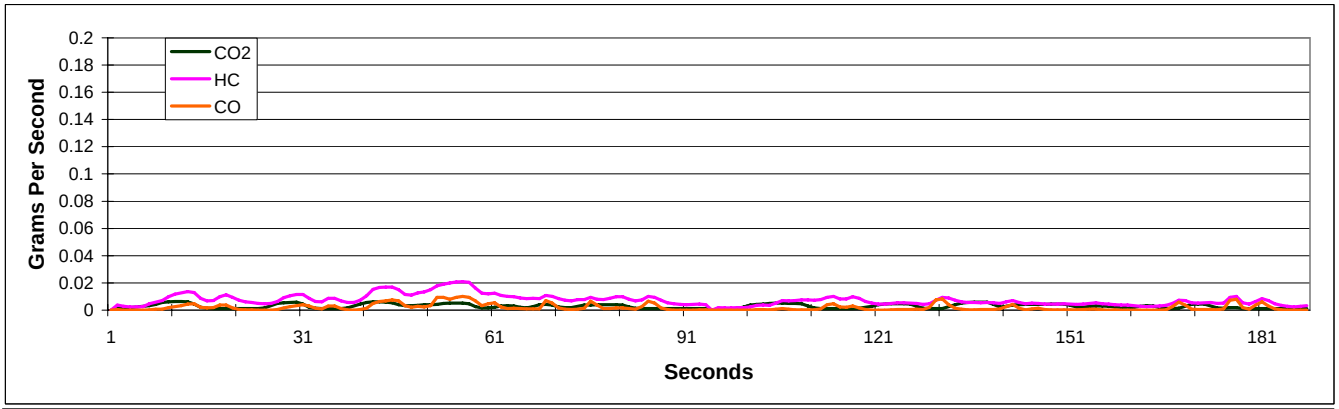


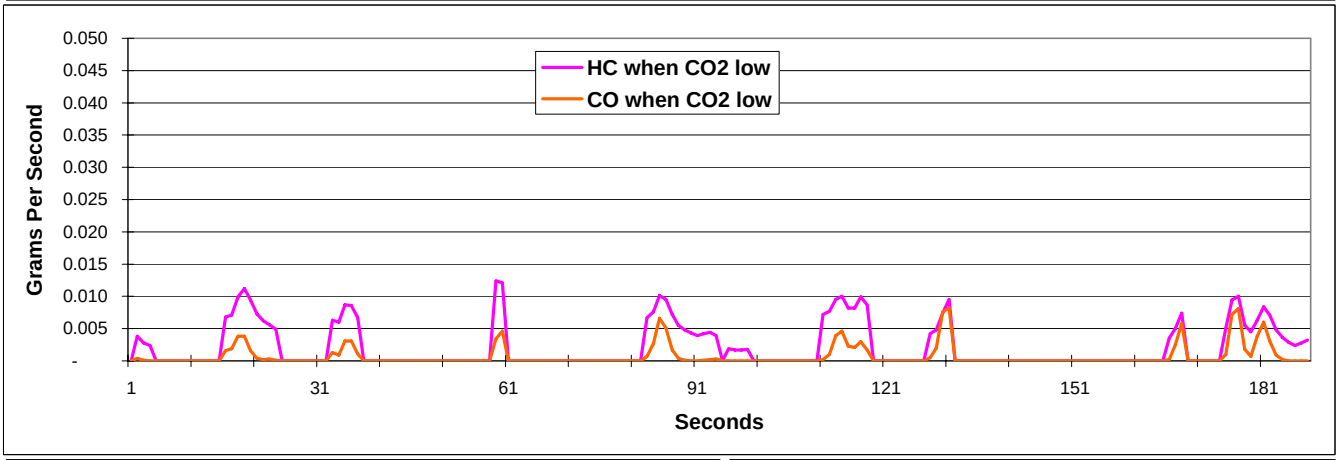


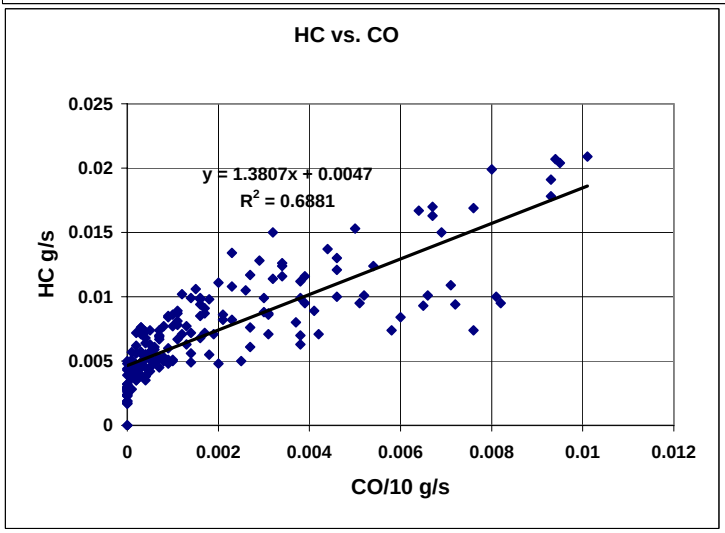


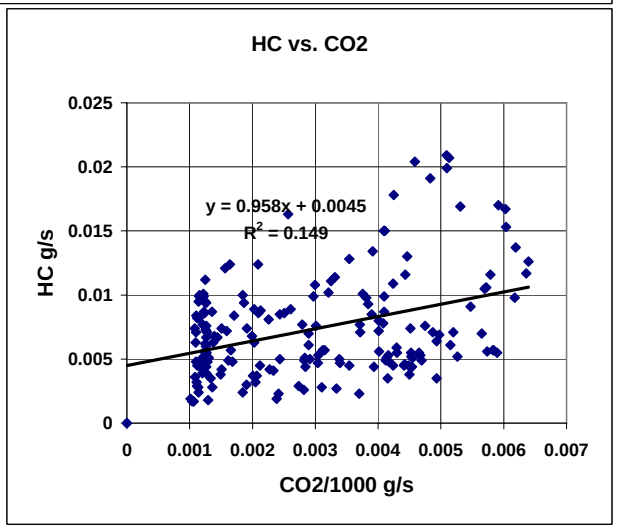
Ref: 75				Leak predicted:	No
Cert: 3030420	VIN: 1G1BL83E4MW216810		Make: CHEV		
Year: 1991	Model: CAPRIC		HC g/mi:	1.25	
	HCLP: No		CO g/mi:	3.28	
	Note: 0				

Avg HC when CO2 low g/s:	0.006	Stdev %:	44%	Avg HC-$HC_{CO:}$	0.005		
HC vs. CO:	A:	1.38	B:	0.005	R^2:	0.69	Stdev HC-$HC_{CO:}$ 0.002
HC vs. CO2	A:	0.96	B:	0.004	R^2:	0.15	Stdev HC-$HC_{CO2:}$ 0.004



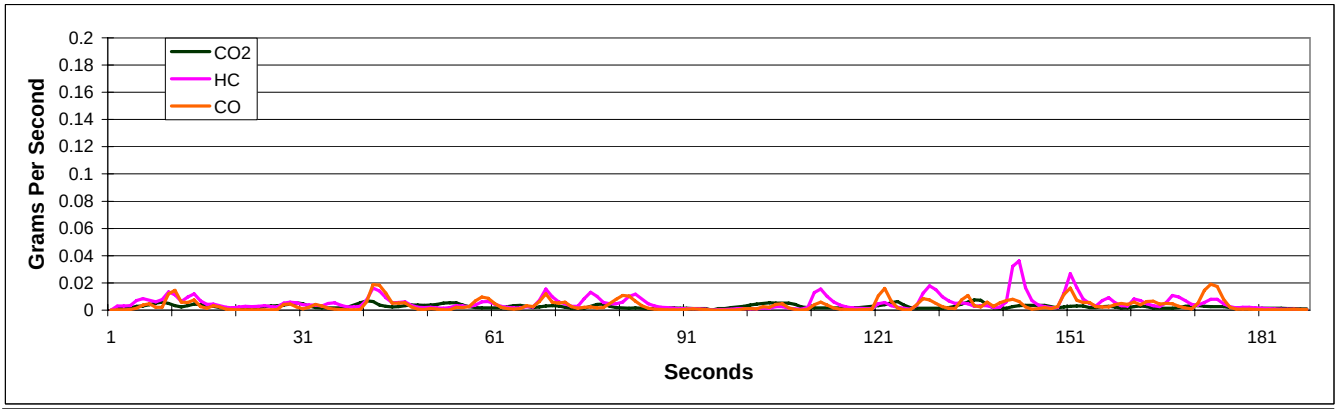


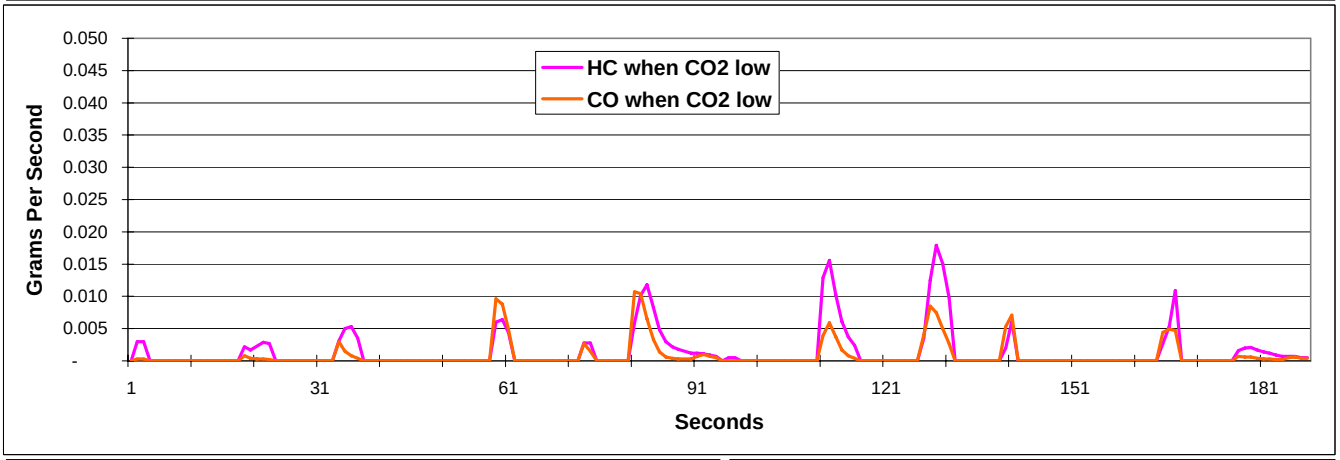


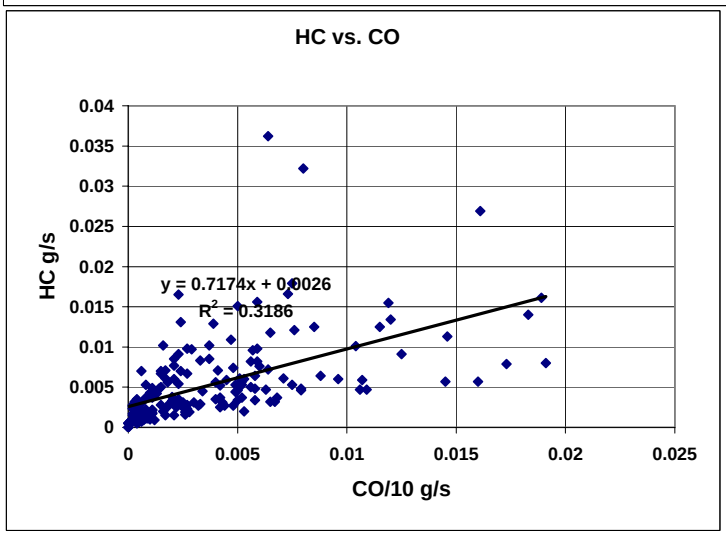


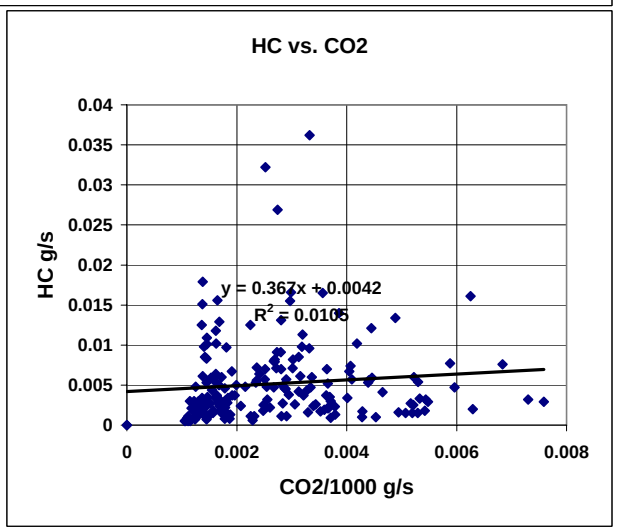
Ref: 76				**Leak predicted:**	No
Cert: 3035935	**VIN:** 1G6CD53B8P4302279		**Make:** CADI		
Year: 1993	**Model:** DEVILL			**HC g/mi:**	0.87
	HCLP: No			**CO g/mi:**	6.03
	Note: 0				

Avg HC when CO2 low g/s:		**0.004**	**Stdev %:**	**99%**	**Avg HC-$HC_{CO:}$**	**0.003**	
HC vs. CO:	**A:**	**0.72**	**B:**	**0.003**	**R^2:**	**0.32**	**Stdev HC-$HC_{CO:}$** **0.004**
HC vs. CO2	**A:**	**0.37**	**B:**	**0.004**	**R^2:**	**0.01**	**Stdev HC-$HC_{CO2:}$** **0.005**



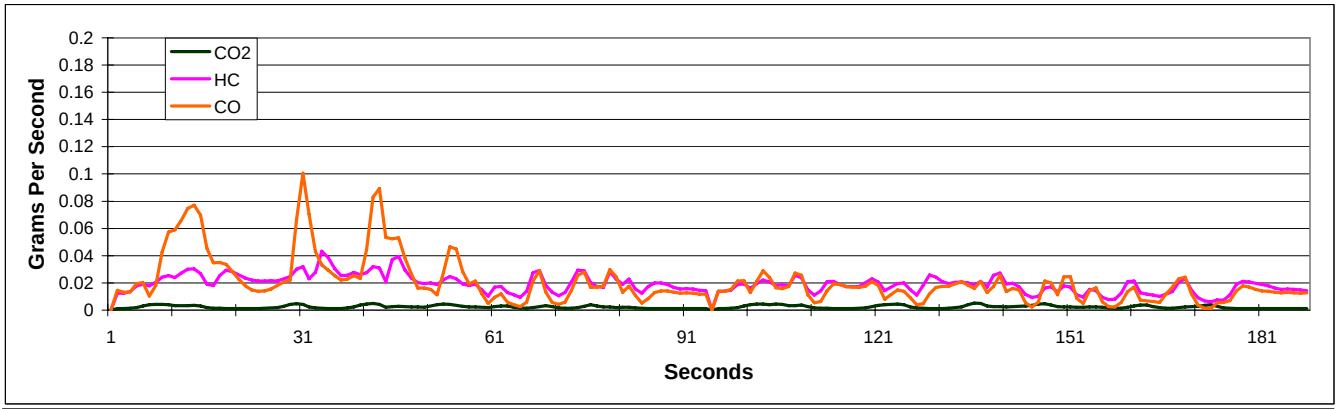


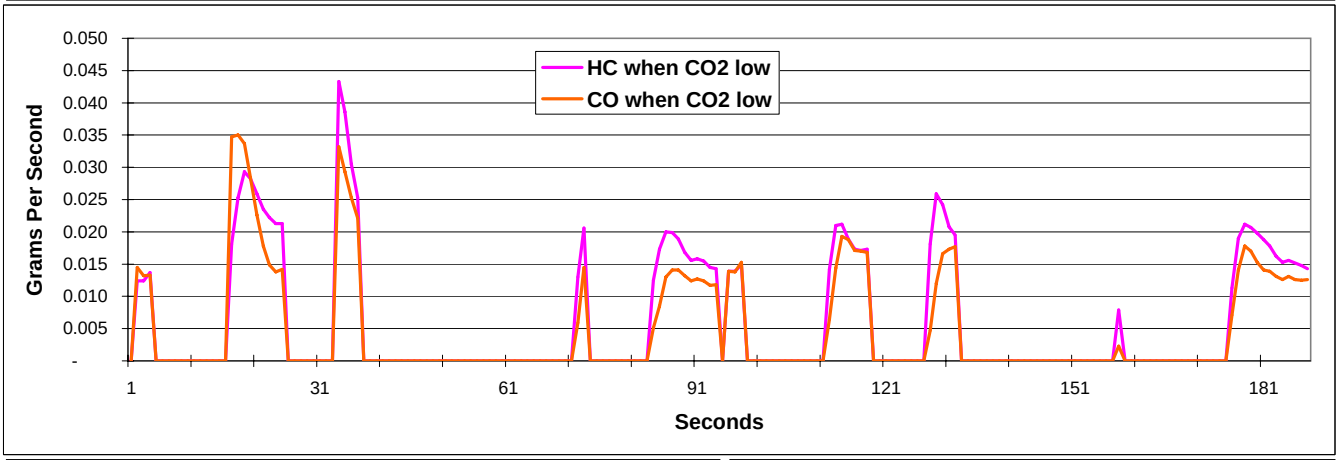


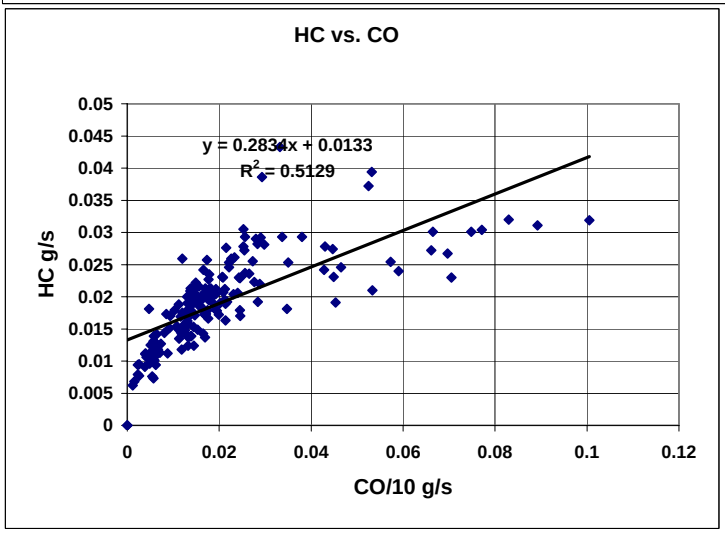


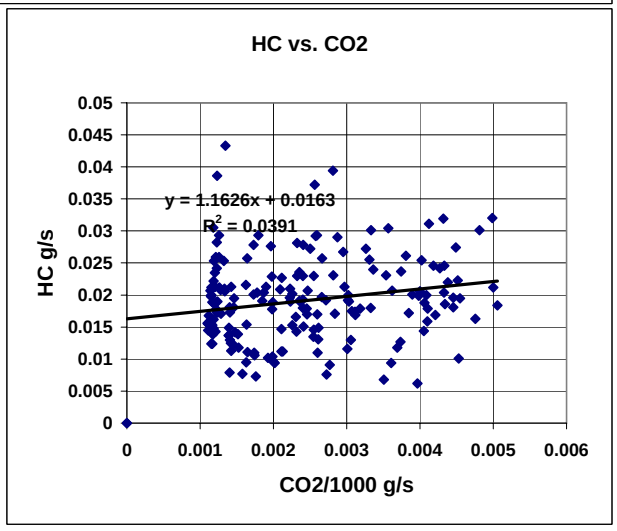
Ref: 77				**Leak predicted:**	Yes
Cert: 3035945	**VIN:** 1G3GK4793GP395247		**Make:** OLDS		
Year: 1986	**Model:** CUTLAS			**HC g/mi:**	3.18
	HCLP: No			**CO g/mi:**	33.95
	Note: 0				

Avg HC when CO2 low g/s:		0.019	**Stdev %:**	35%	**Avg HC-$HC_{CO:}$**	0.013	
HC vs. CO:	**A:**	0.28	**B:**	0.013	**R^2:**	0.51	**Stdev HC-$HC_{CO:}$** 0.005
HC vs. CO2	**A:**	1.16	**B:**	0.016	**R^2:**	0.04	**Stdev HC-$HC_{CO2:}$** 0.007



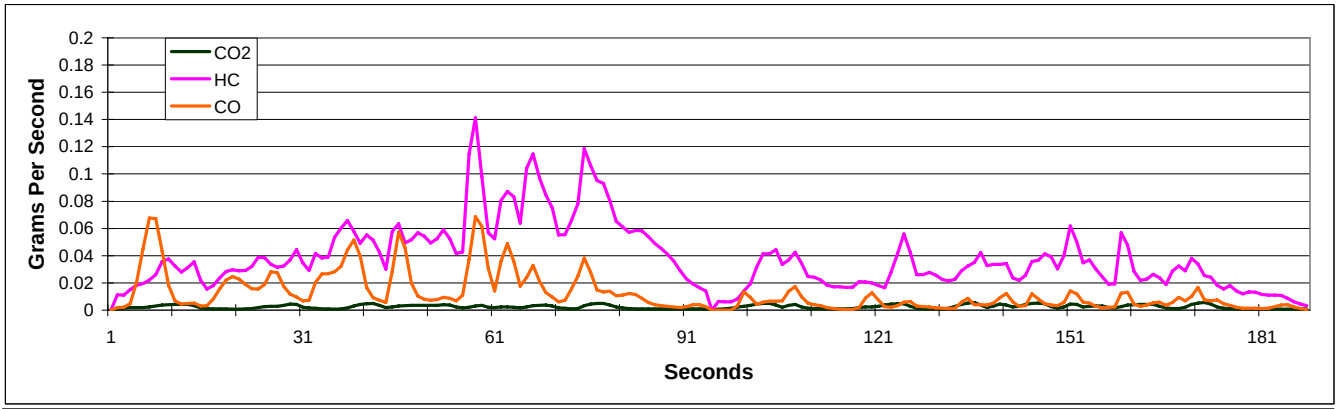


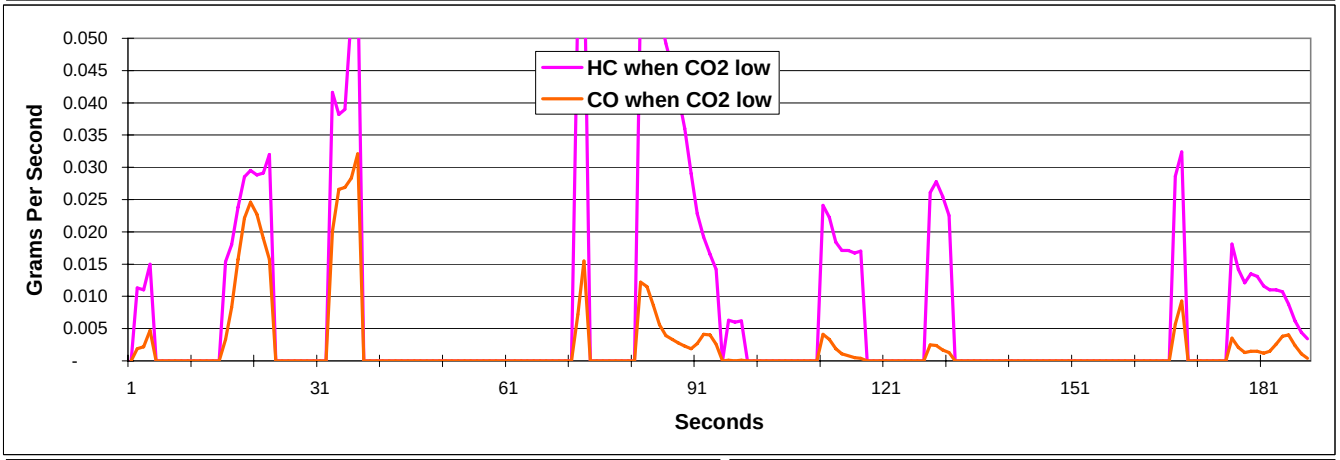


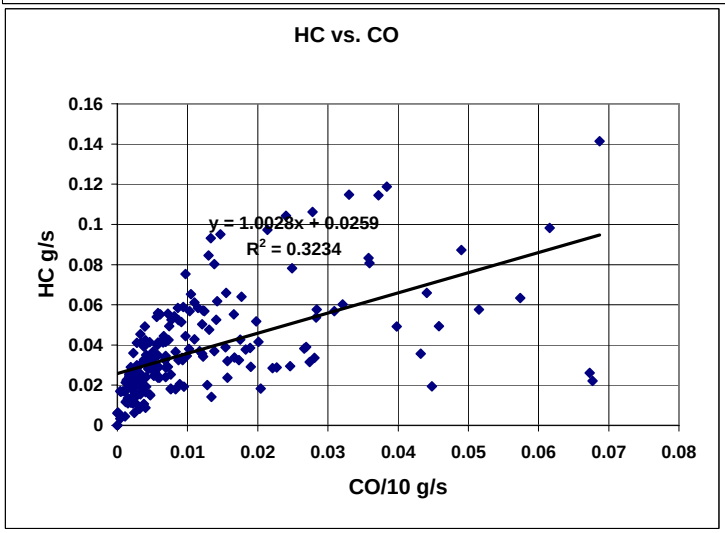


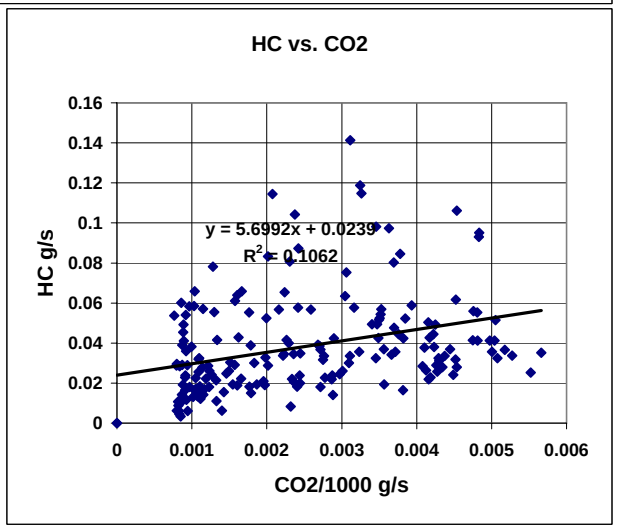
Ref: 78					**Leak predicted:** Yes
Cert: 3030456	**VIN:** 1GMCU06D4MT221824		**Make:** PONT		
Year: 1991	**Model:** TRANS			**HC g/mi:**	6.44
	HCLP: No			**CO g/mi:**	20.54
	Note: 0				

Avg HC when CO2 low g/s:	0.026	**Stdev %:**	65%	**Avg HC-$HC_{CO:}$**	0.026		
HC vs. CO:	**A:** 1.00	**B:**	0.026	**R^2:**	0.32	**Stdev HC-$HC_{CO:}$**	0.020
HC vs. CO2	**A:** 5.70	**B:**	0.024	**R^2:**	0.11	**Stdev HC-$HC_{CO2:}$**	0.023









Ref: 79 | Leak predicted: Yes

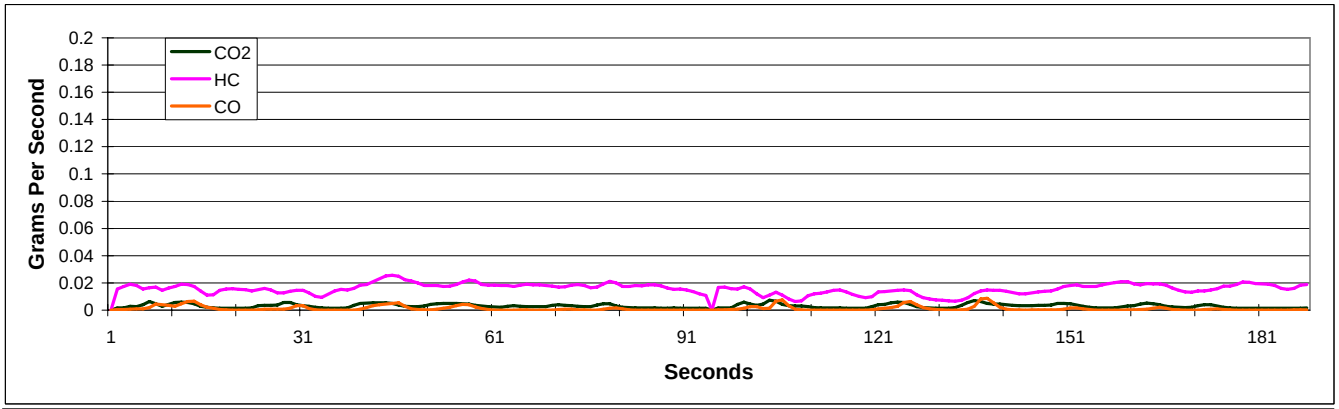
Cert: 3030491 | VIN: 1G1YY2180H5116866 | Make: CHEV

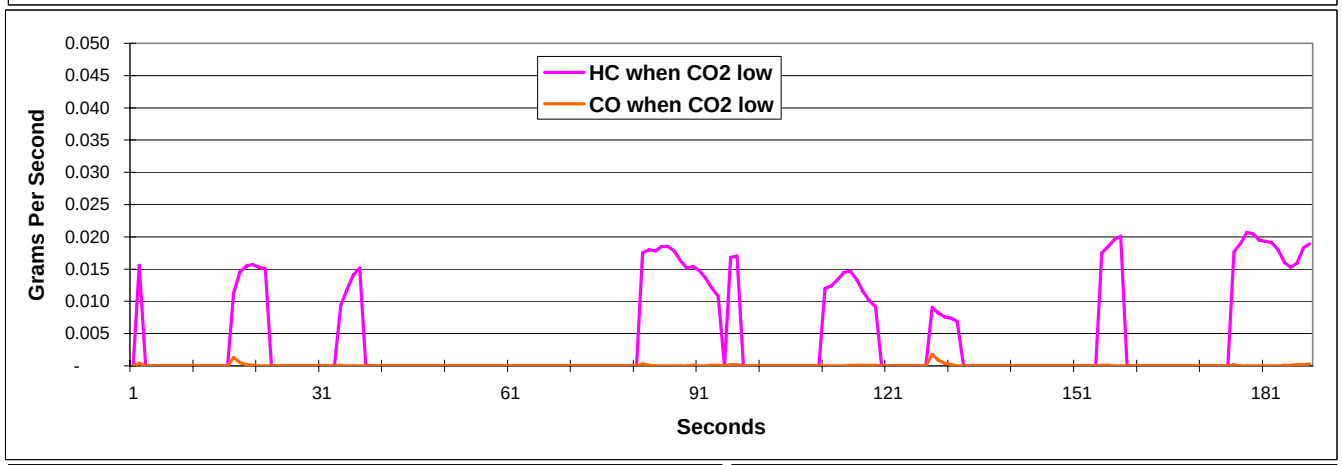
Year: 1987 | Model: CORVET | HC g/mi: 2.59

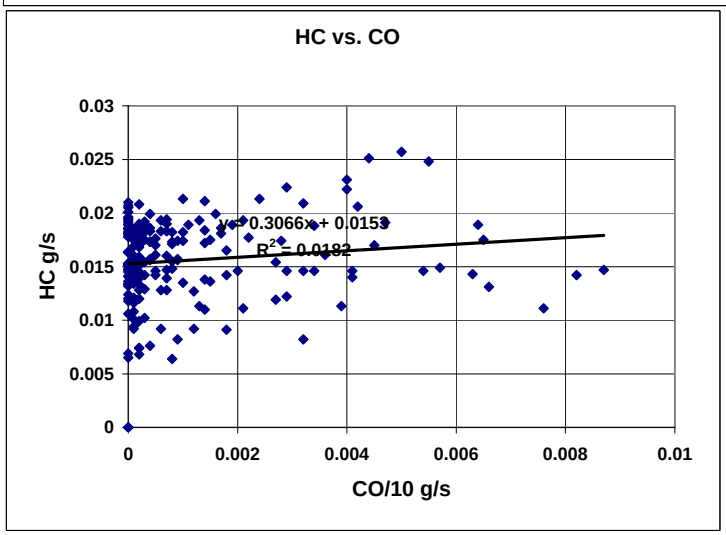
HCLP: Yes | CO g/mi: 1.95

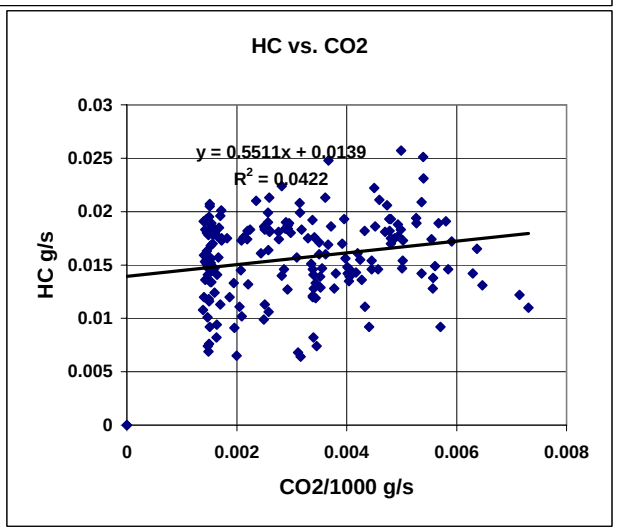
Note: fuel tank top / injector rail both sides

Avg HC when CO2 low g/s:		0.015	Stdev %:	28%	Avg HC-$HC_{CO:}$	0.015		
HC vs. CO:	A:	0.31	B:	0.015	R^2:	0.02	Stdev HC-$HC_{CO:}$	0.004
HC vs. CO2	A:	0.55	B:	0.014	R^2:	0.04	Stdev HC-$HC_{CO2:}$	0.004



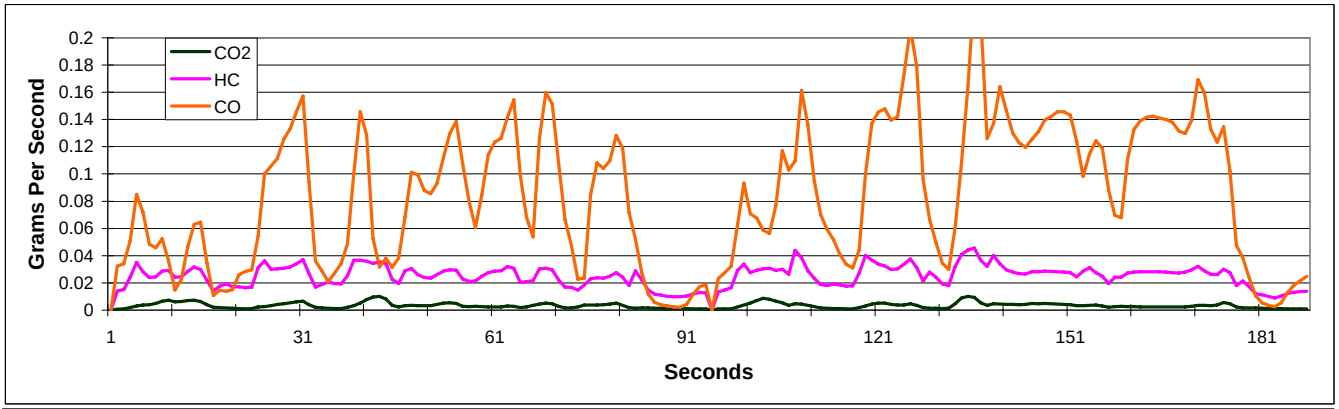


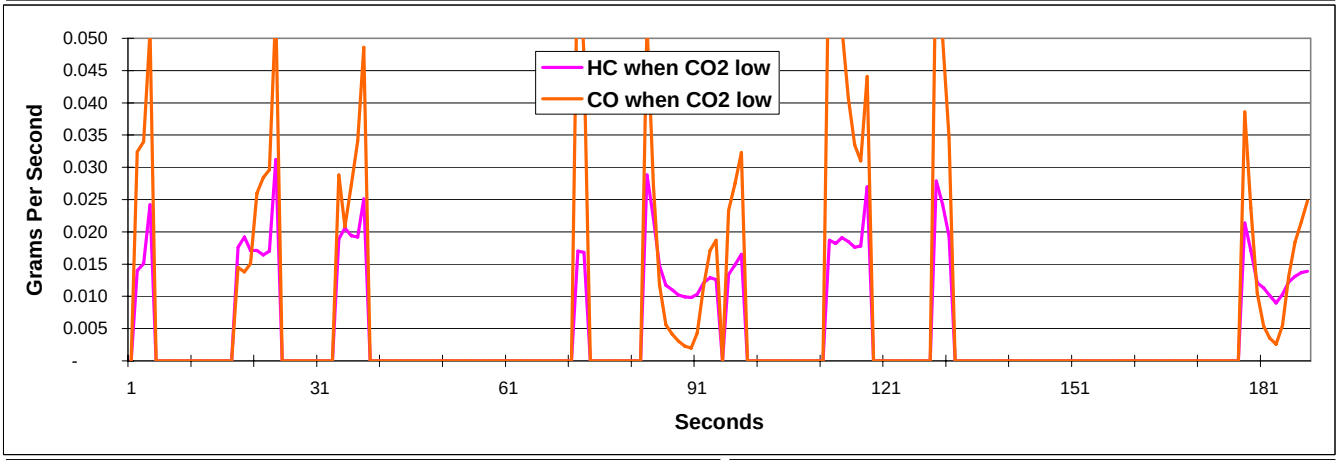


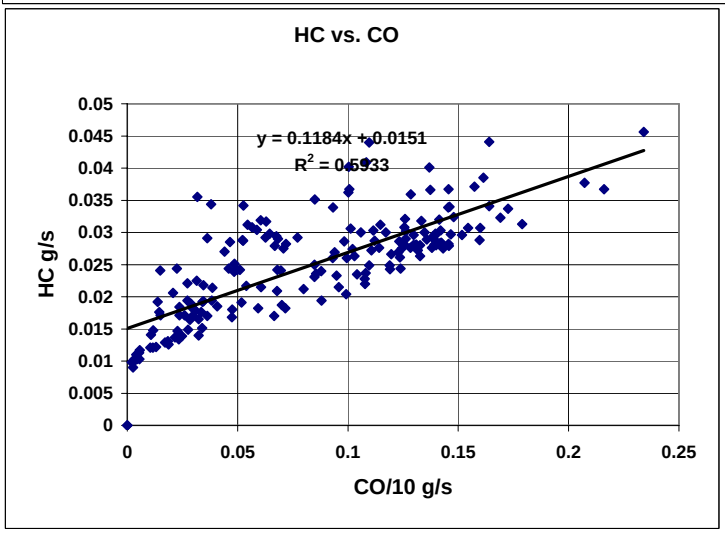


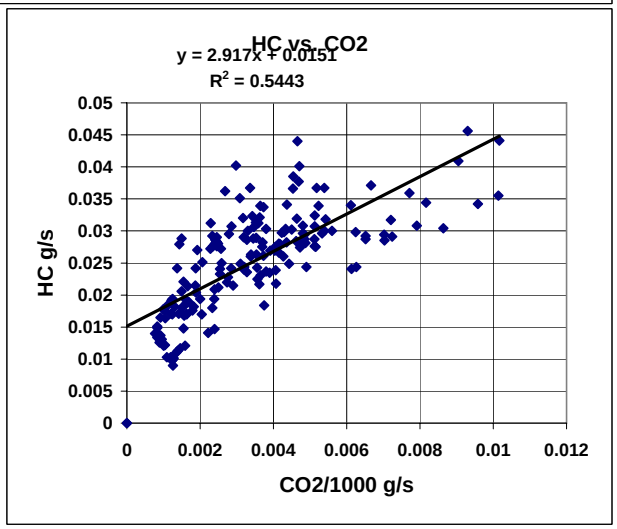
Ref: 80				**Leak predicted:**	No
Cert: 3017531	**VIN:** 1GNER16K0MF114021		**Make:** CHEV		
Year: 1991	**Model:** R1500		**HC g/mi:**	4.24	
	HCLP: Yes		**CO g/mi:**	141.63	
	Note: fuel tank top				

Avg HC when CO2 low g/s:	0.016	**Stdev %:**	35%	**Avg HC-HC$_{CO:}$**	0.015		
HC vs. CO:	**A:** 0.12	**B:**	0.015	**R^2:**	0.59	**Stdev HC-HC$_{CO:}$**	0.005
HC vs. CO2	**A:** 2.92	**B:**	0.015	**R^2:**	0.54	**Stdev HC-HC$_{CO2:}$**	0.005



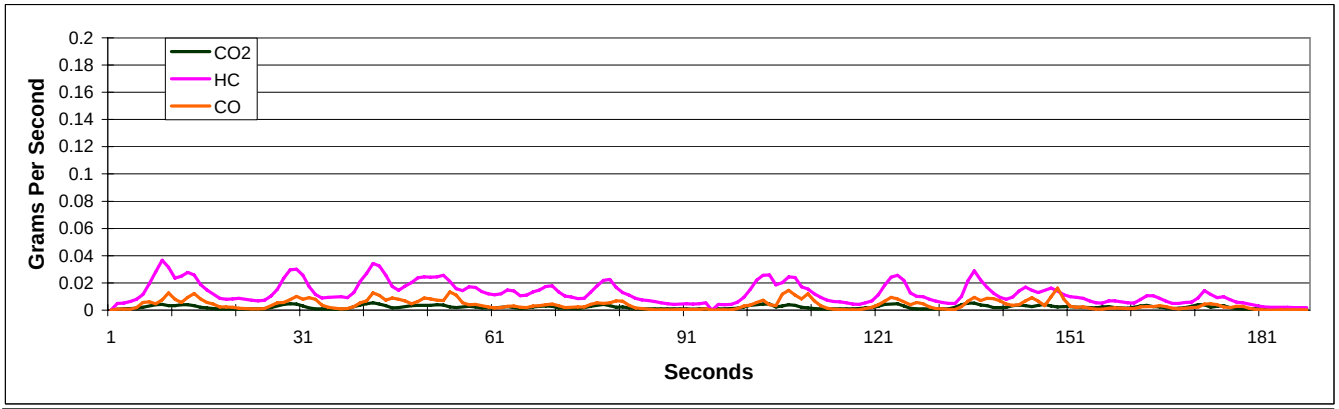


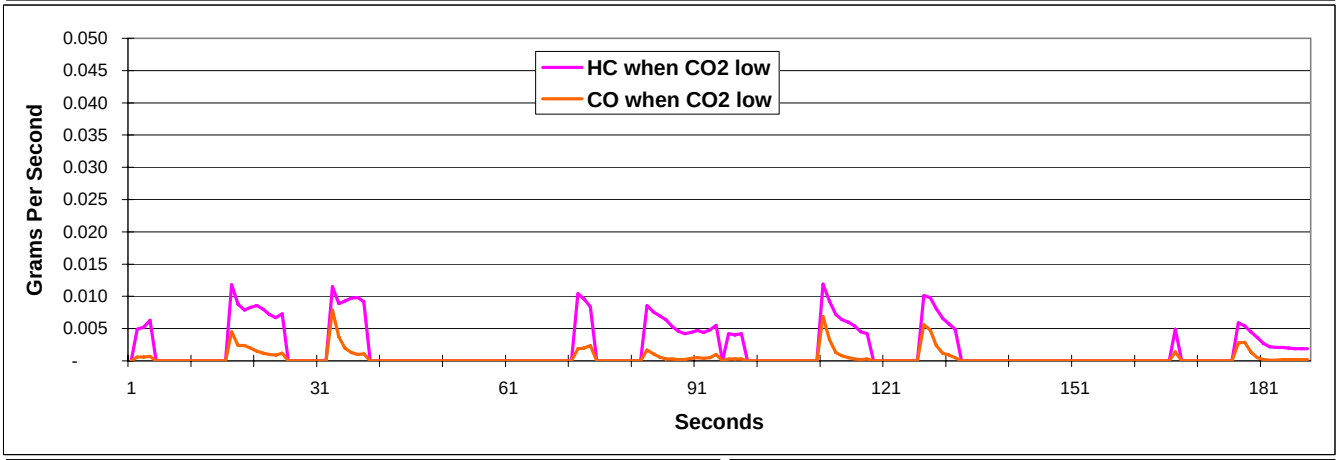


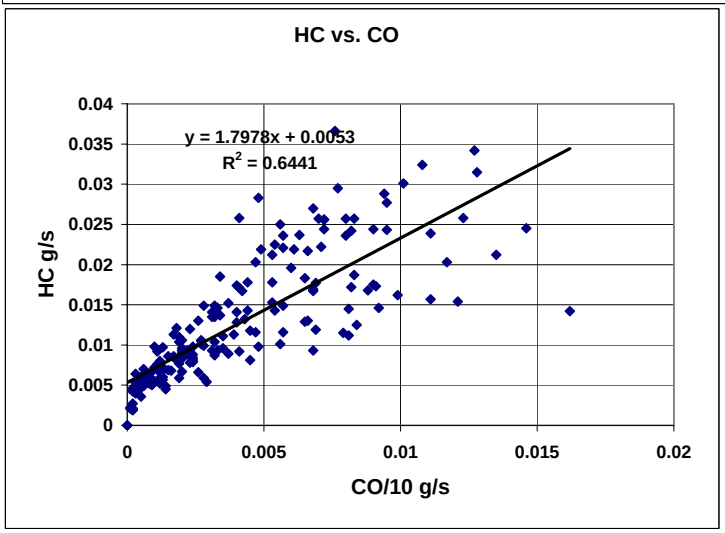


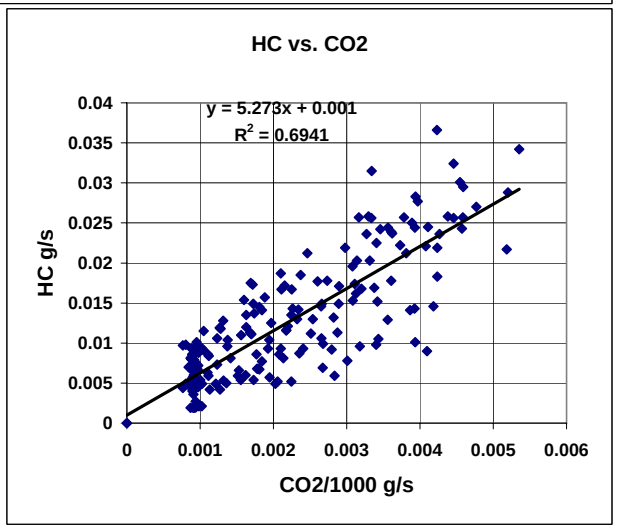
Ref: 81				Leak predicted:	No
Cert: 2922930	VIN: 1B3XC4639MD264008		Make: DODG		
Year: 1991	Model: DAYTON		HC g/mi:	2.12	
	HCLP: No		CO g/mi:	6.79	
	Note: 0				

Avg HC when CO2 low g/s:	0.006	Stdev %:	45%	Avg HC-$HC_{CO:}$	0.005		
HC vs. CO:	A:	1.80	B:	0.005	R^2:	0.64	Stdev HC-$HC_{CO:}$ 0.005
HC vs. CO2	A:	5.27	B:	0.001	R^2:	0.69	Stdev HC-$HC_{CO2:}$ 0.004



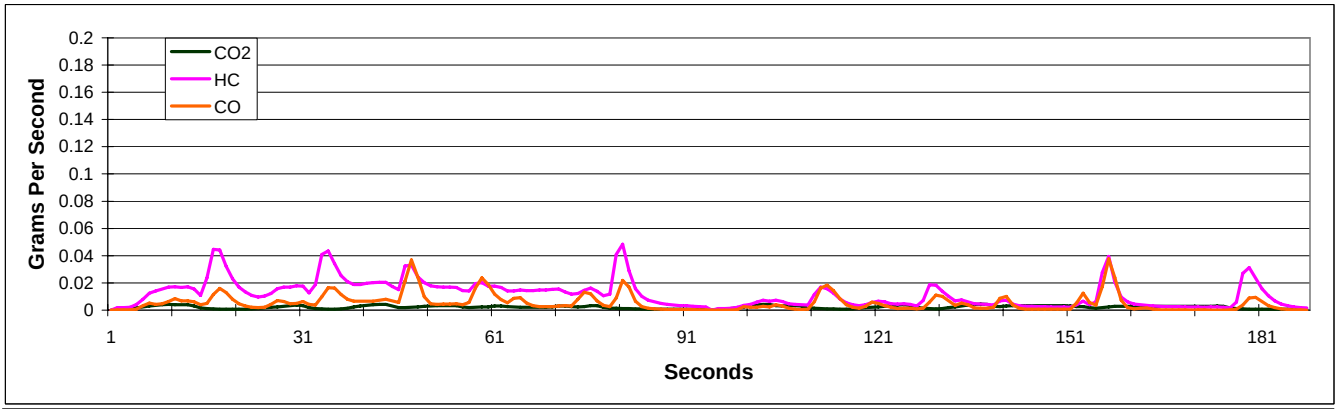


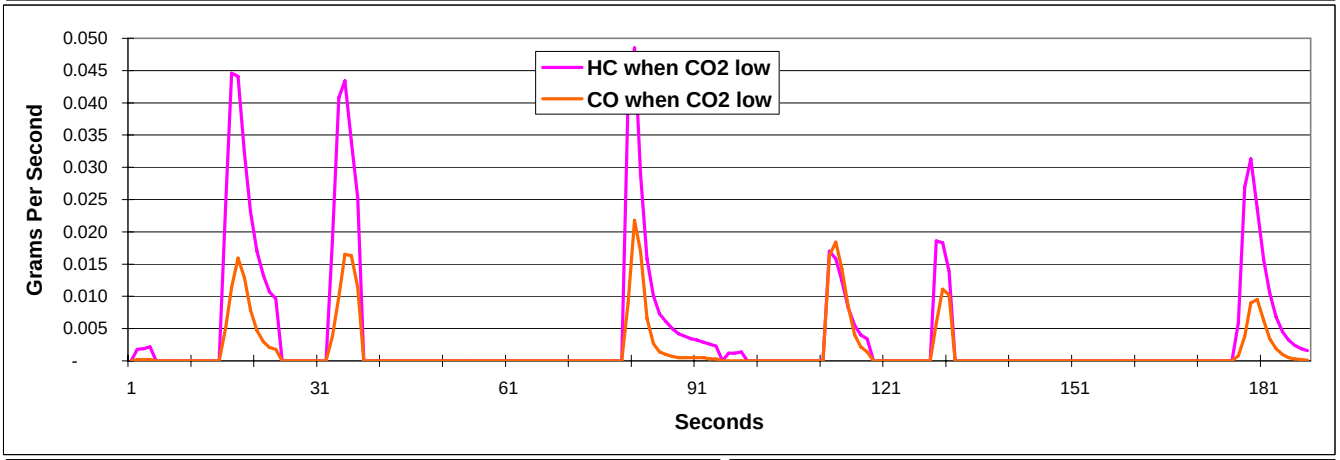


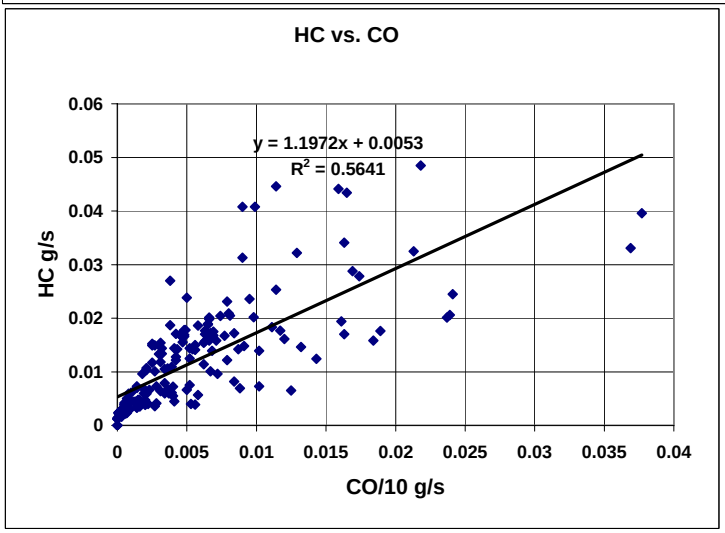


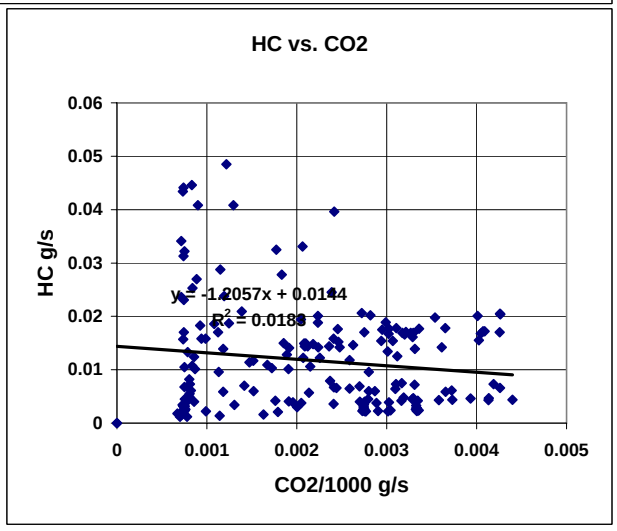
Ref: 82				Leak predicted:	Yes
Cert: 3017394	VIN: 1G4AG5542S6425708		Make: BUIC		
Year: 1995	Model: CENTUR			HC g/mi:	2.02
	HCLP: No			CO g/mi:	9.20
	Note: 0				

Avg HC when CO2 low g/s:		0.015	Stdev %:	91%	Avg HC-HC_{CO_2}:	0.005	
HC vs. CO:	A:	1.20	B:	0.005	R^2:	0.56	Stdev HC-HC_{CO_2}: 0.007
HC vs. CO2	A:	(1.21)	B:	0.014	R^2:	0.02	Stdev HC-HC_{CO_2}: 0.010



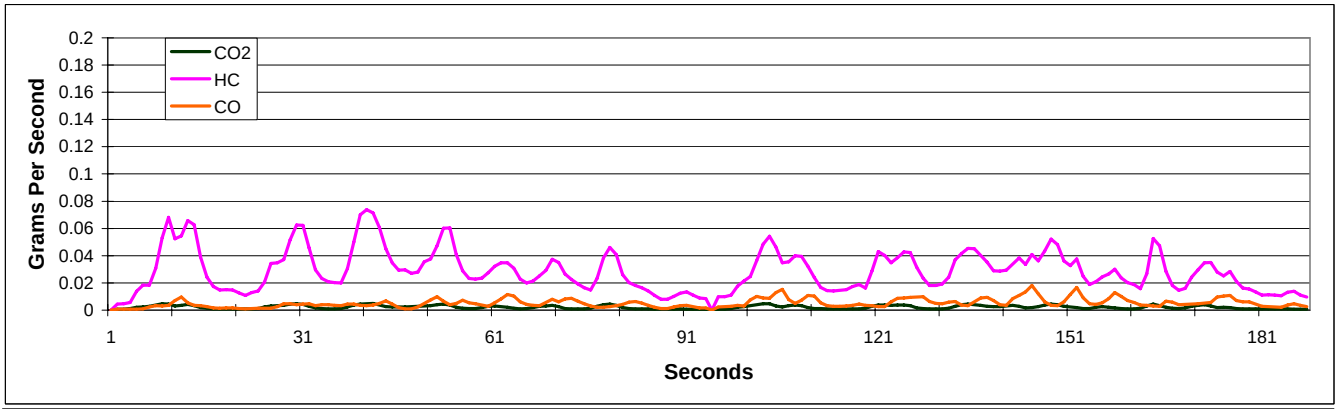


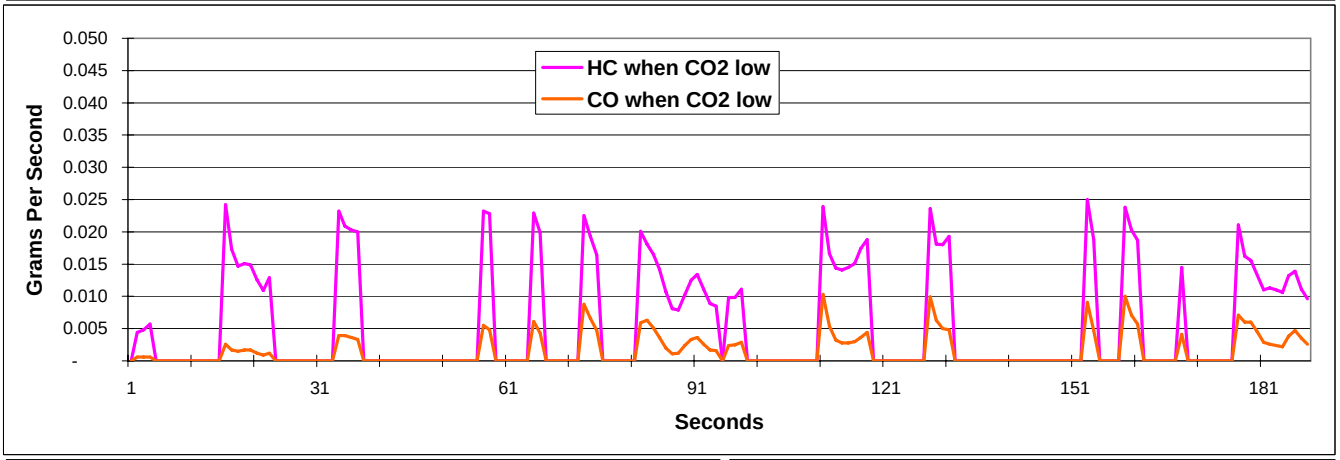


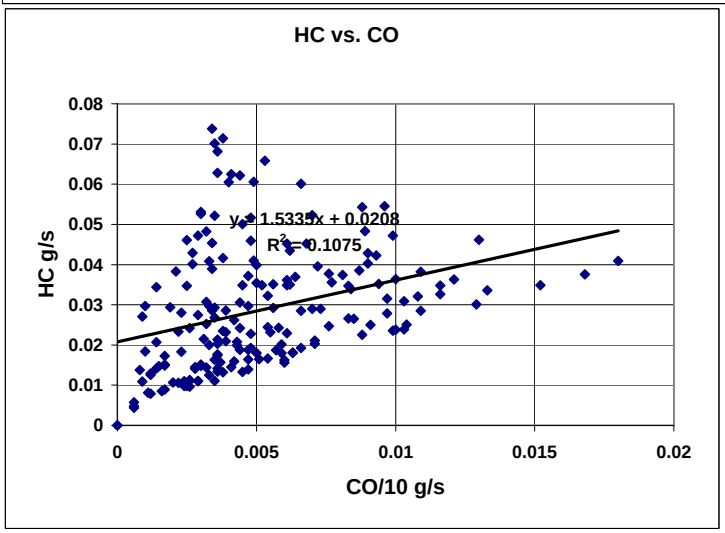


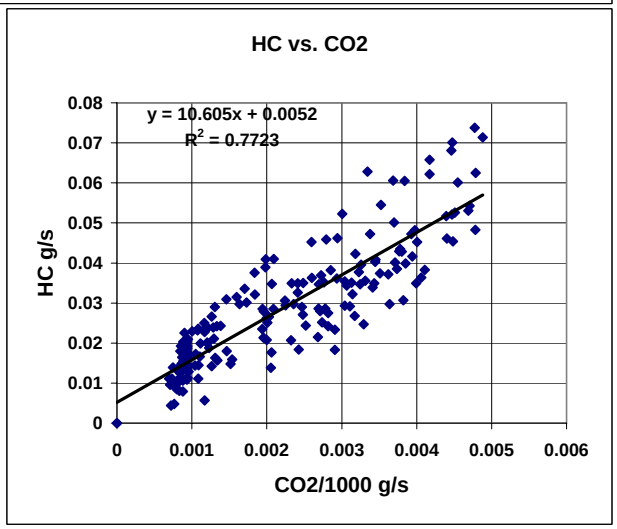
Ref: 83				**Leak predicted:**	No
Cert: 3017561	**VIN:** 1G1LV14W3KY271585		**Make:** CHEV		
Year: 1989	**Model:** BERETT			**HC g/mi:**	4.85
	HCLP: Yes			**CO g/mi:**	8.67
	Note: R/S engine near steering pump				

Avg HC when CO2 low g/s:		**0.016**	**Stdev %:**	**33%**	**Avg HC-HC$_{CO_2}$**	**0.021**	
HC vs. CO:	**A:**	**1.53**	**B:**	**0.021**	**R^2:**	**0.11**	**Stdev HC-HC$_{CO_2}$** **0.014**
HC vs. CO2	**A:**	**10.61**	**B:**	**0.005**	**R^2:**	**0.77**	**Stdev HC-HC$_{CO_2}$** **0.007**



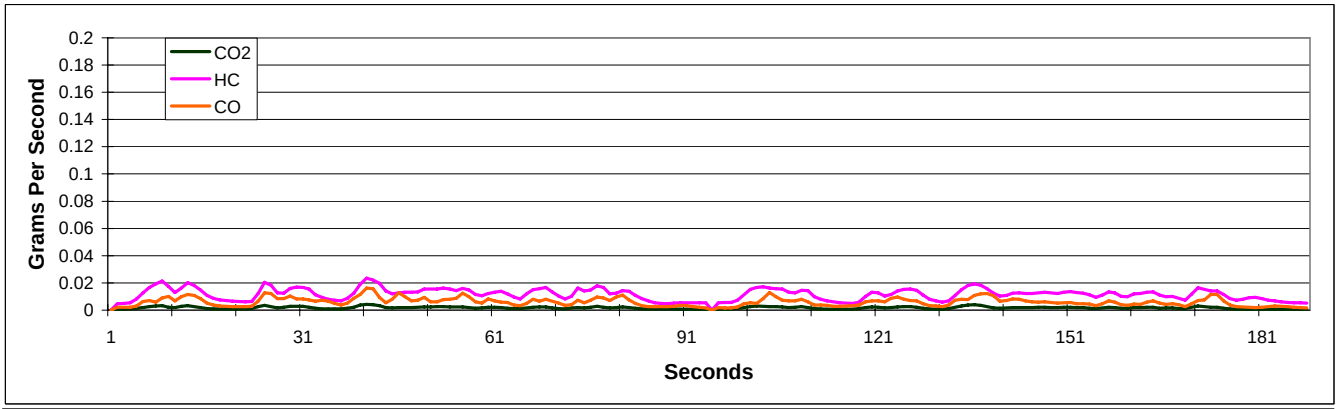


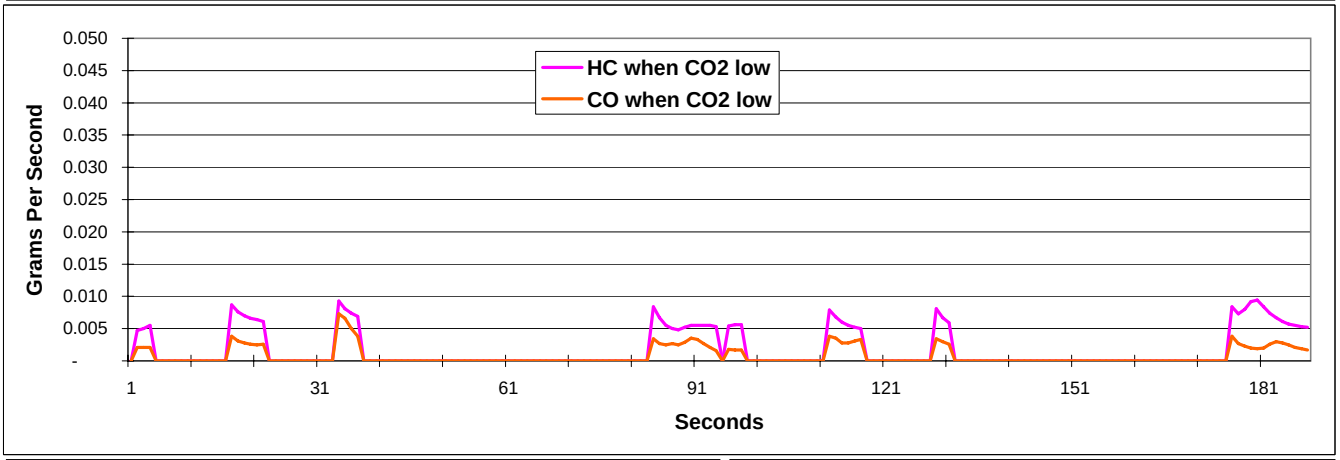


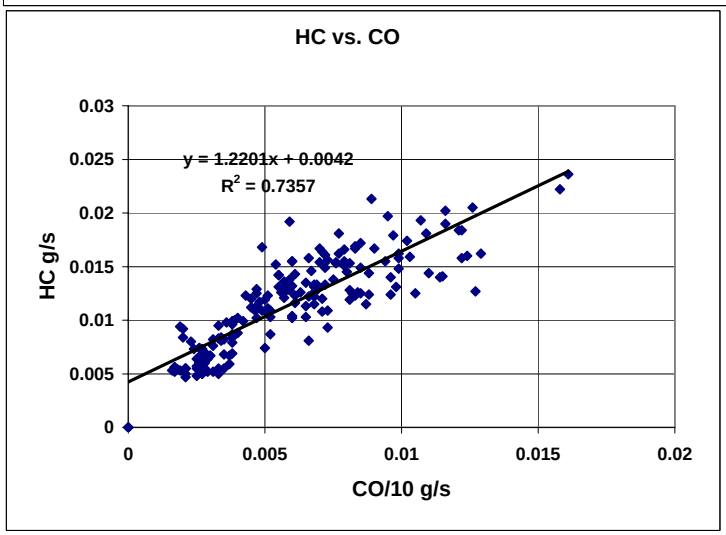


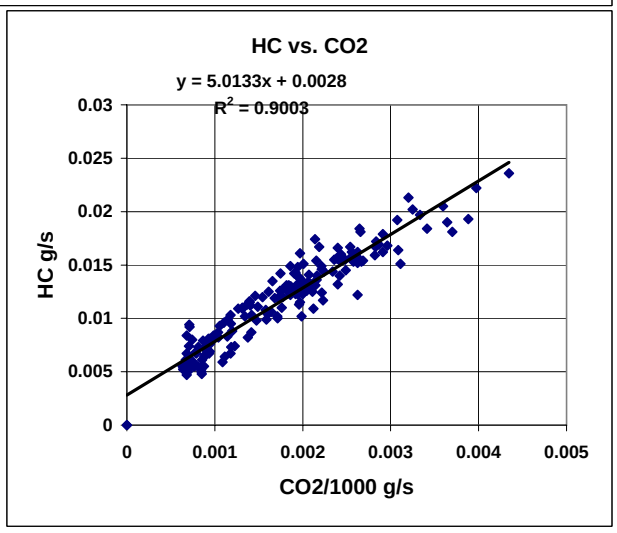
Ref: 84				Leak predicted:	No
Cert: 3017575	VIN: 1G8ZK5578PZ223133		Make: STRN		
Year: 1993	Model: SL			HC g/mi:	1.94
	HCLP: No			CO g/mi:	10.07
	Note: 0				

Avg HC when CO2 low g/s:	0.006	Stdev %:	25%	Avg HC-$HC_{CO:}$	0.004		
HC vs. CO:	A:	1.22	B:	0.004	R^2:	0.74	Stdev HC-$HC_{CO:}$	0.002
HC vs. CO2	A:	5.01	B:	0.003	R^2:	0.90	Stdev HC-$HC_{CO2:}$	0.001



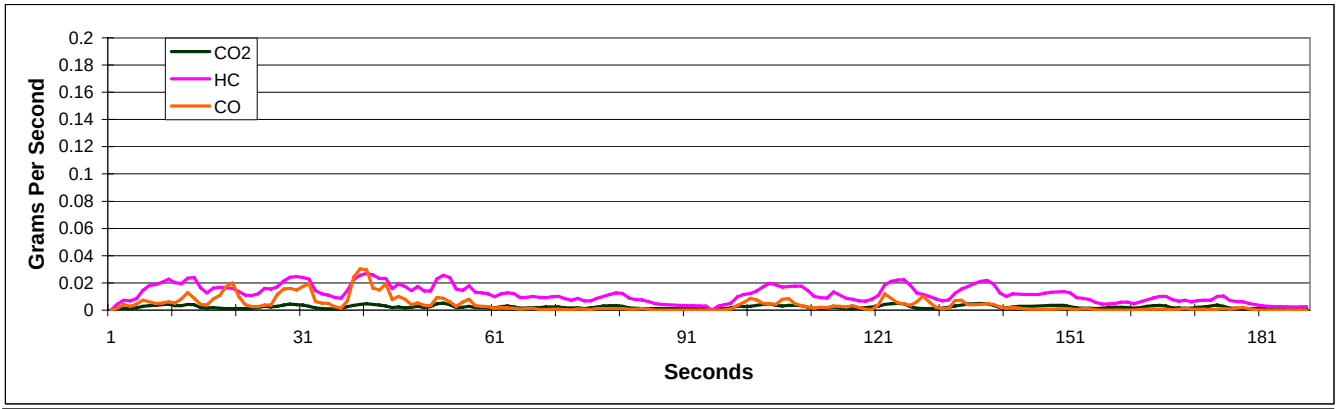


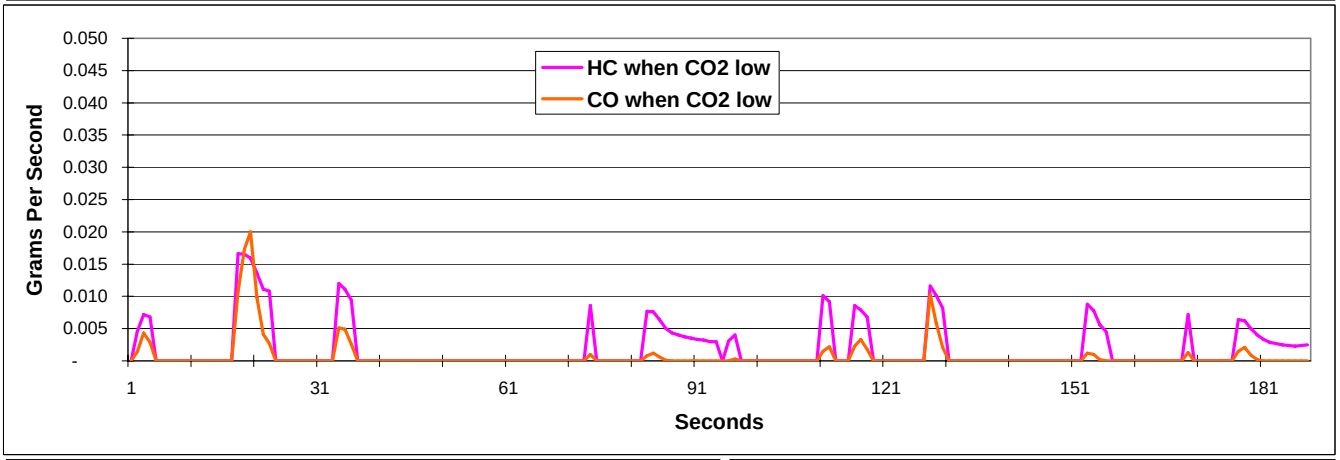


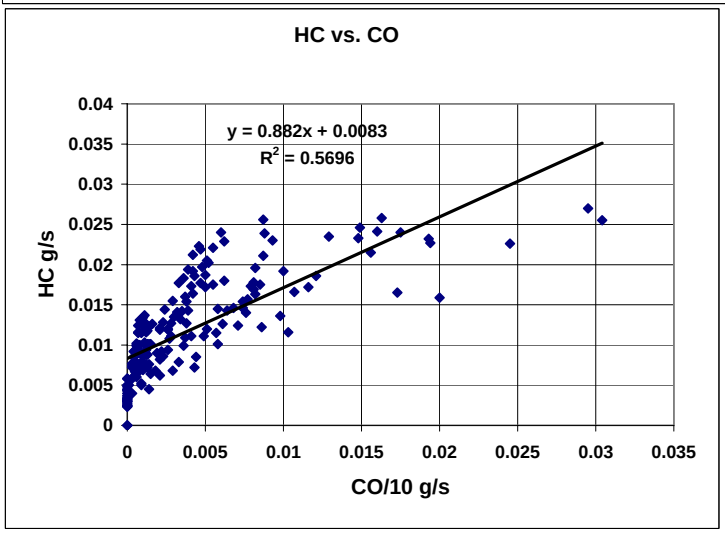


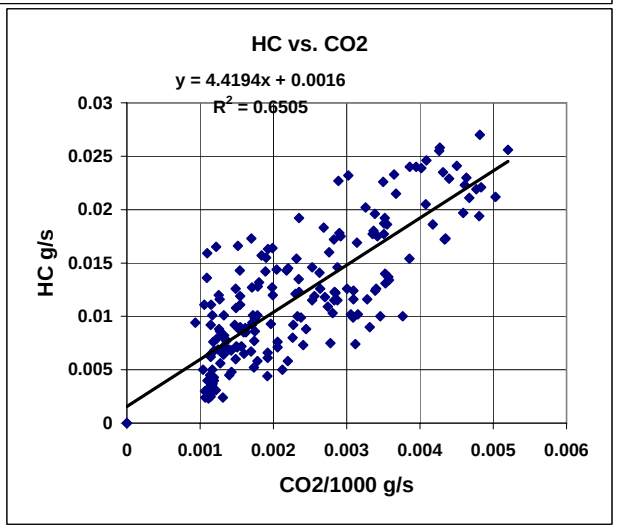
Ref: 86				**Leak predicted:**	No
Cert: 3035804	**VIN:** 2B3ED56T7PH585482		**Make:** DODG		
Year: 1993	**Model:** INTREP			**HC g/mi:**	2.03
	HCLP: No			**CO g/mi:**	6.92
	Note: 0				

Avg HC when CO2 low g/s:	0.007	**Stdev %:**	60%	**Avg HC-$HC_{CO:}$**	0.008		
HC vs. CO:	**A:** 0.88	**B:** 0.008		**R^2:**	0.57	**Stdev HC-$HC_{CO:}$**	0.004
HC vs. CO2	**A:** 4.42	**B:** 0.002		**R^2:**	0.65	**Stdev HC-$HC_{CO2:}$**	0.004



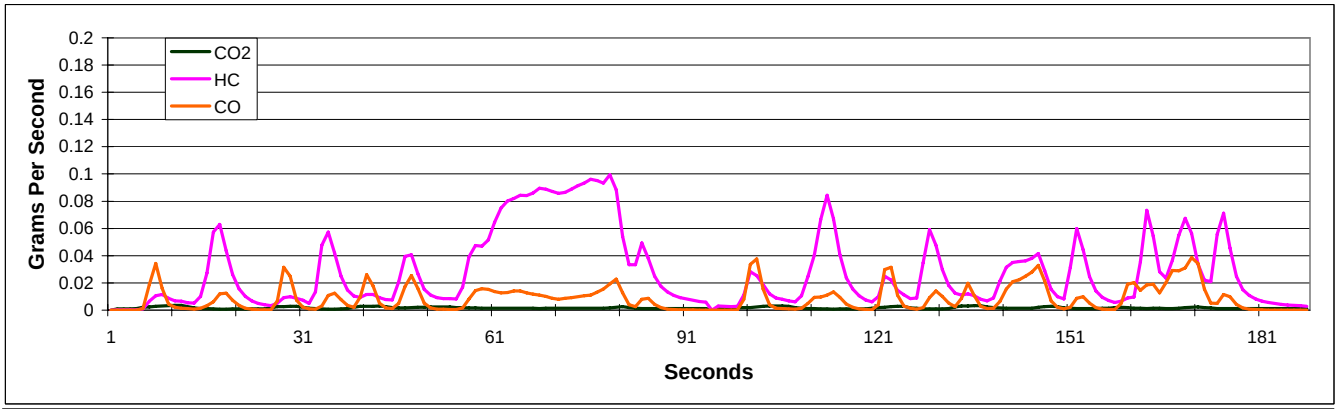


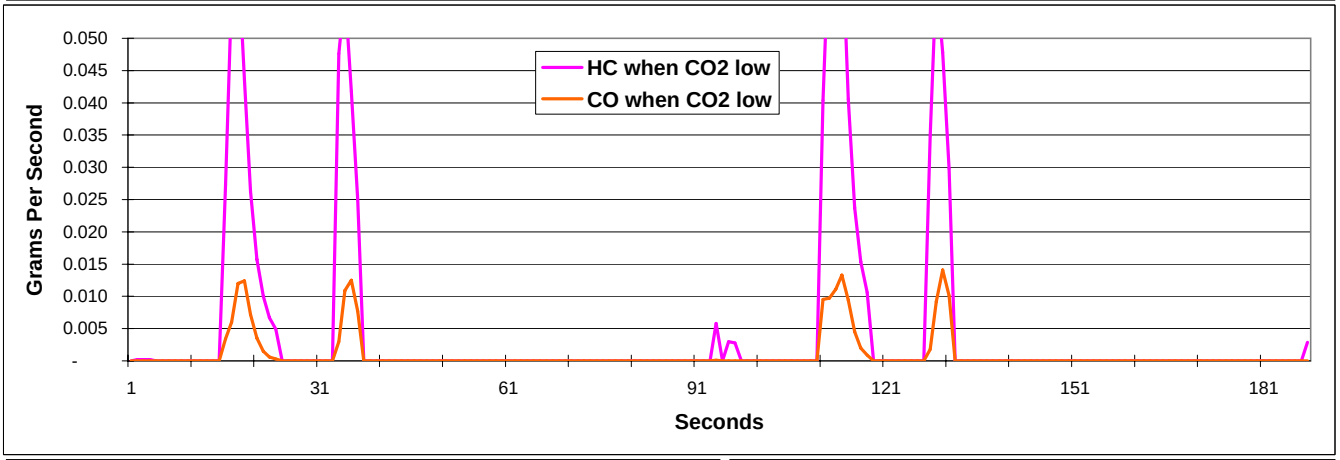


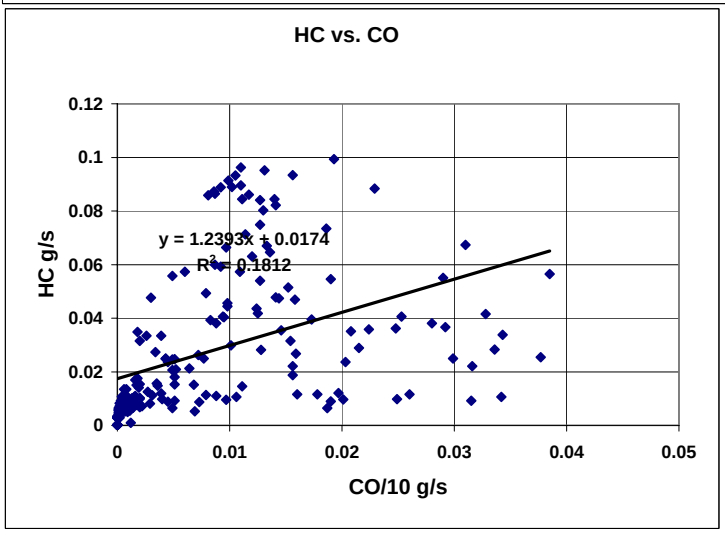


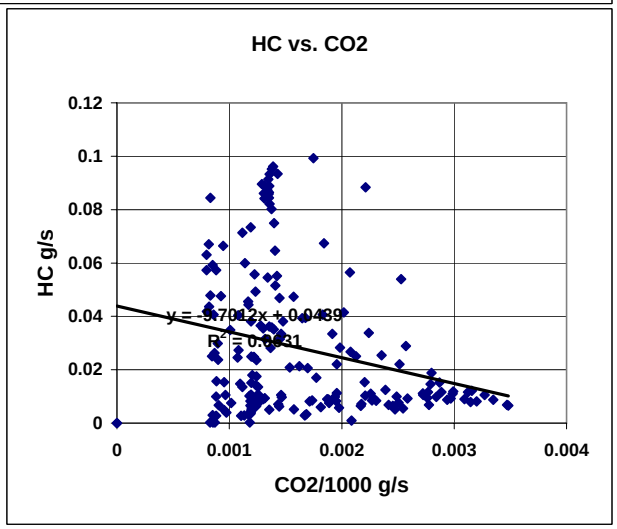
Ref: 87				**Leak predicted:**	Yes
Cert: 3017593	**VIN:** 1G3JC51K9HK319020		**Make:** OLDS		
Year: 1987	**Model:** FIRENZ			**HC g/mi:**	4.72
	HCLP: Yes			**CO g/mi:**	14.50
	Note: filler neck				

Avg HC when CO2 low g/s:	0.032	**Stdev %:**	74%	**Avg HC-$HC_{CO:}$**	0.017		
HC vs. CO:	**A:** 1.24	**B:**	0.017	**R^2:**	0.18	**Stdev HC-$HC_{CO:}$**	0.025
HC vs. CO2	**A:** (9.70)	**B:**	0.044	**R^2:**	0.06	**Stdev HC-$HC_{CO2:}$**	0.026



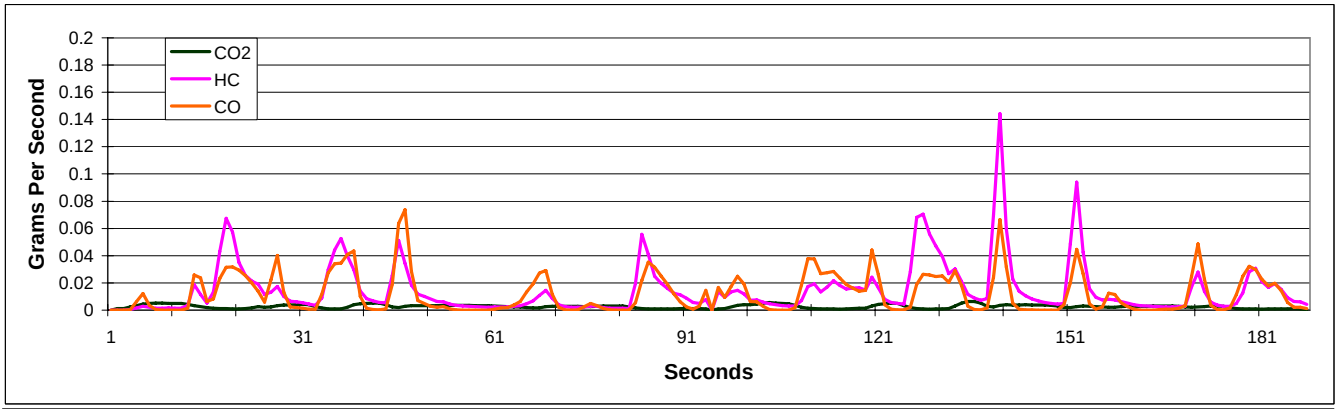


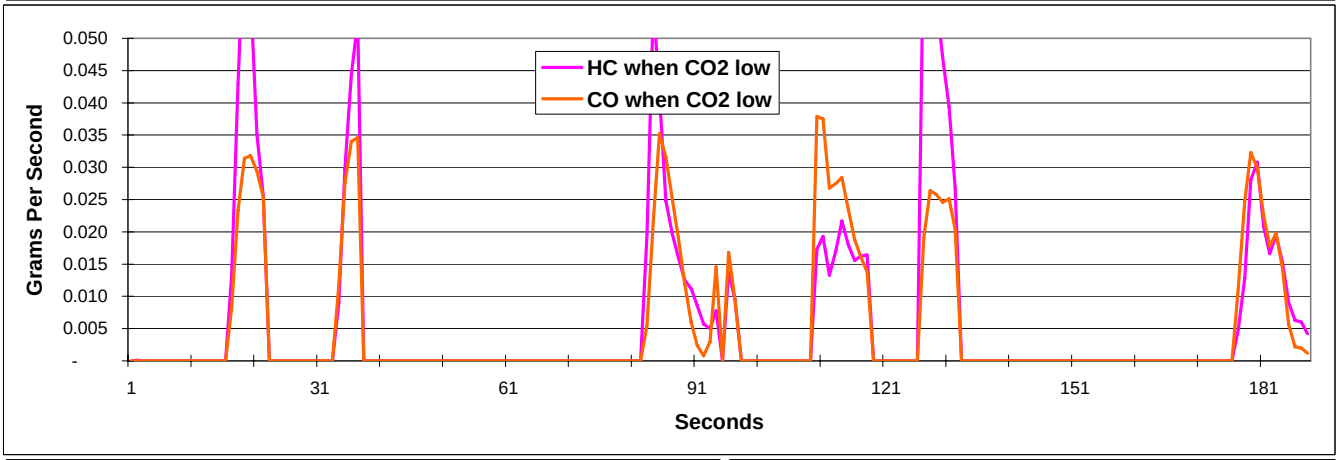


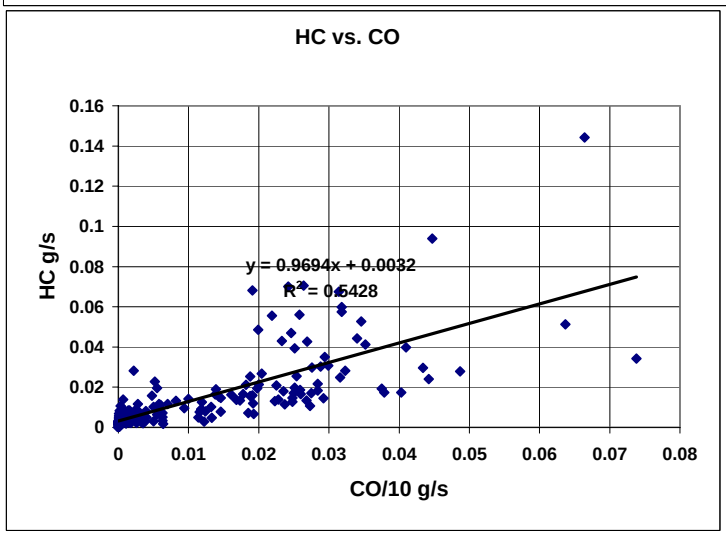


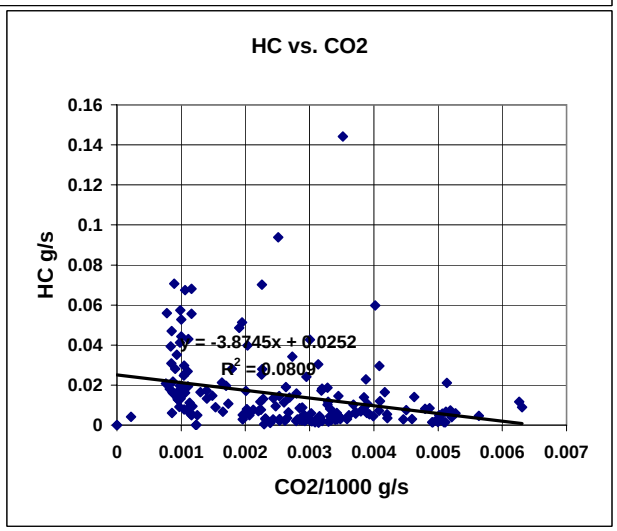
Ref:	**88**			**Leak predicted:**	**Yes**
Cert:	**3016273**	**VIN:**	**1GNCS13W2S2195966**	**Make:**	**CHEV**
Year:	**1995**	**Model:**	**BLAZER**	**HC g/mi:**	**2.50**
		HCLP:	**No**	**CO g/mi:**	**20.22**
		Note:	**0**		

Avg HC when CO2 low g/s:		**0.024**	**Stdev %:**	**76%**	**Avg HC-$HC_{CO:}$**	**0.003**	
HC vs. CO:	**A:**	**0.97**	**B:**	**0.003**	**R^2:**	**0.54**	**Stdev HC-$HC_{CO:}$** **0.013**
HC vs. CO2	**A:**	**(3.87)**	**B:**	**0.025**	**R^2:**	**0.08**	**Stdev HC-$HC_{CO2:}$** **0.018**



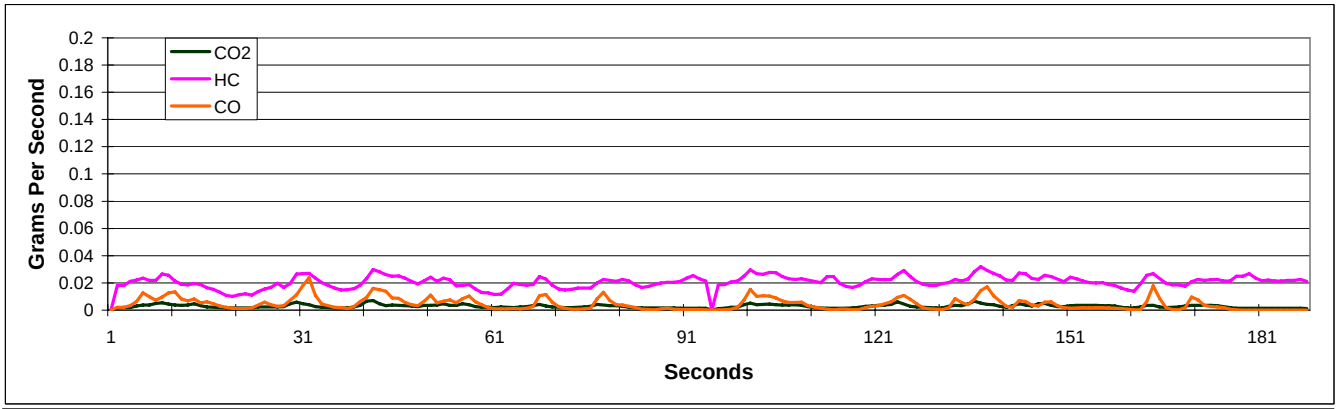


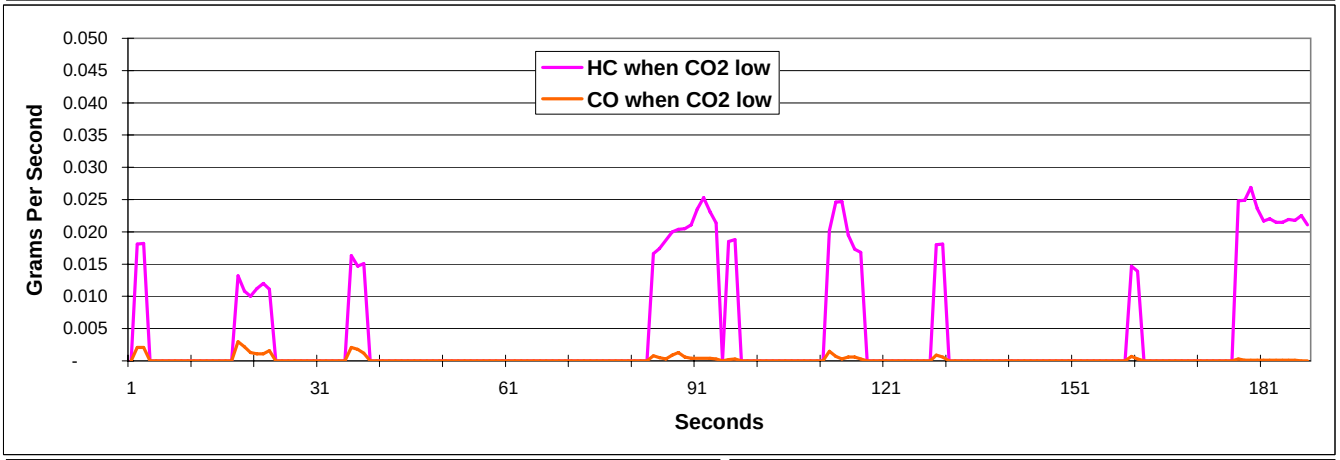


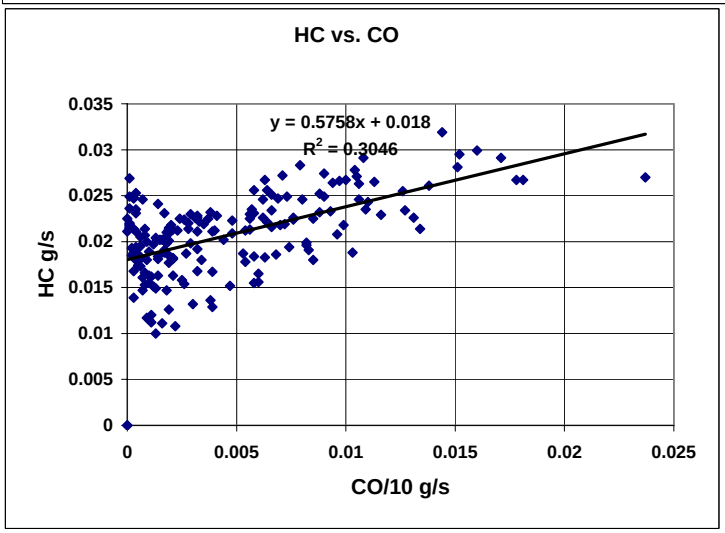


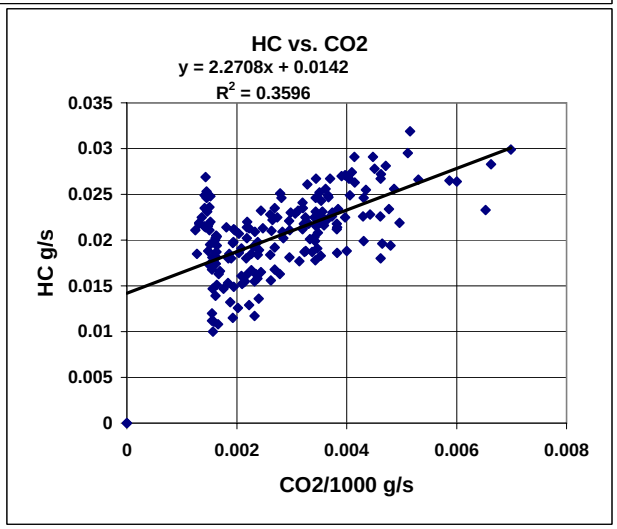
Ref:	**89**					**Leak predicted:**	**Yes**
Cert:	**3016277**	**VIN:**	**1G2FS2184KL241442**	**Make:**	**PONT**		
Year:	**1989**	**Model:**	**FIREBI**		**HC g/mi:**	**3.47**	
		HCLP:	**Yes**		**CO g/mi:**	**7.59**	
		Note:	**filler neck / fuel tank top**				

Avg HC when CO2 low g/s:		**0.019**	**Stdev %:**	**28%**	**Avg HC-$HC_{CO:}$**	**0.018**	
HC vs. CO:	**A:**	**0.58**	**B:**	**0.018**	**R^2:**	**0.30**	**Stdev HC-$HC_{CO:}$** **0.004**
HC vs. CO2	**A:**	**2.27**	**B:**	**0.014**	**R^2:**	**0.36**	**Stdev HC-$HC_{CO2:}$** **0.004**



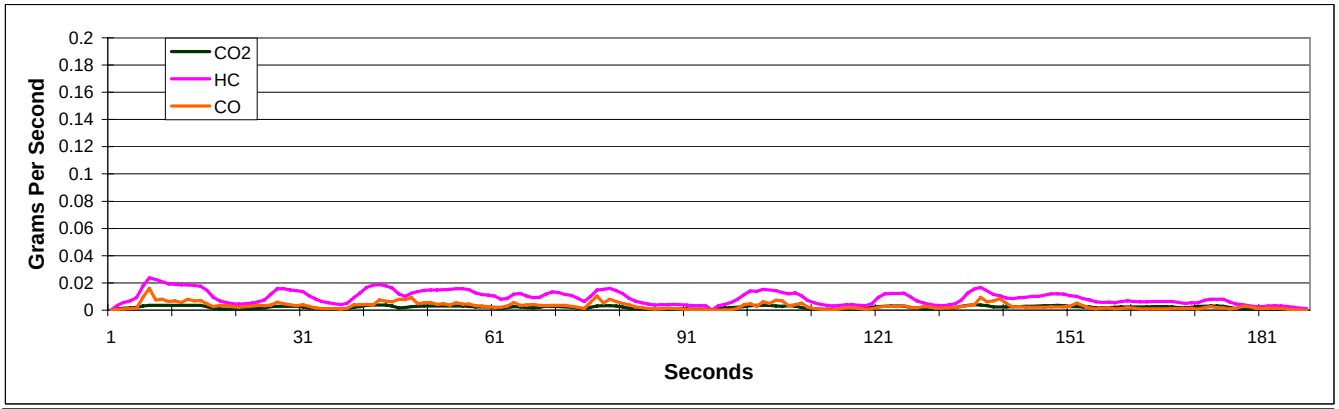


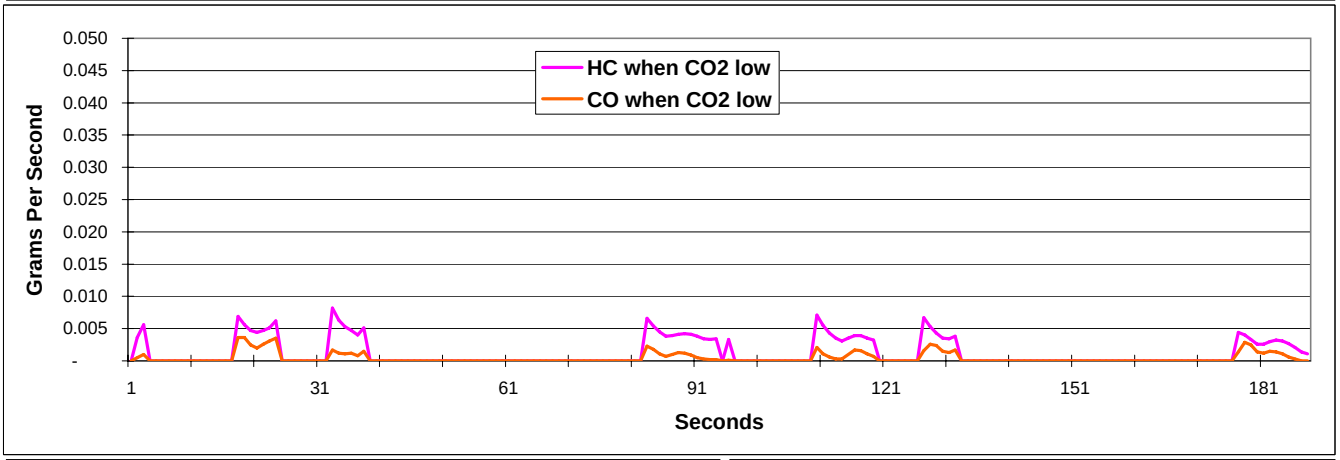


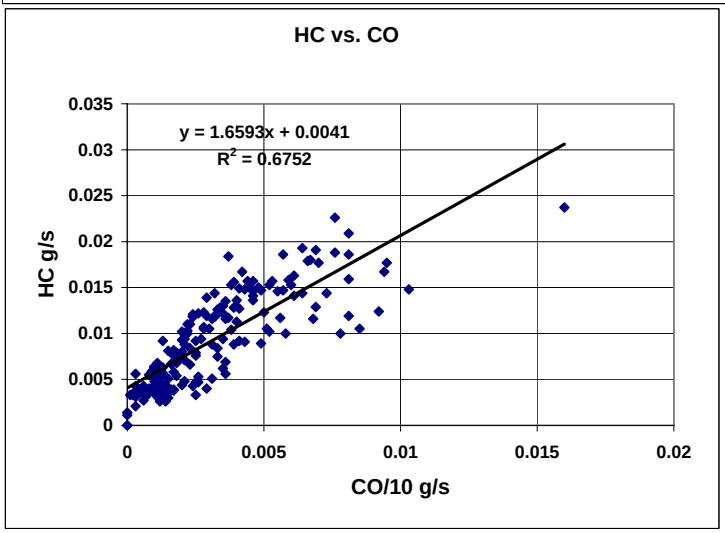


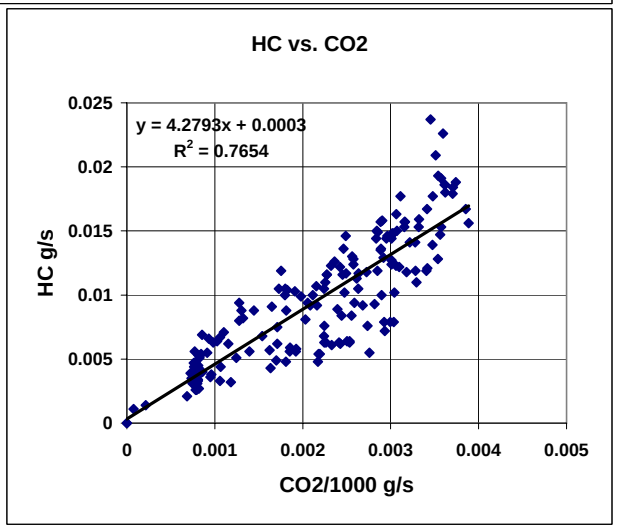
Ref: 90				**Leak predicted:** No	
Cert: 3030557	**VIN:** 1N4BU31F7PC247984		**Make:** NISS		
Year: 1993	**Model:** ALTIMA			**HC g/mi:**	1.56
	HCLP: No			**CO g/mi:**	5.25
	Note: 0				

Avg HC when CO2 low g/s:		**0.004**	**Stdev %:**	**36%**	**Avg HC-$HC_{CO:}$**	**0.004**	
HC vs. CO:	**A:**	**1.66**	**B:**	**0.004**	**R^2:**	**0.68**	**Stdev HC-$HC_{CO:}$** **0.003**
HC vs. CO2	**A:**	**4.28**	**B:**	**0.000**	**R^2:**	**0.77**	**Stdev HC-$HC_{CO2:}$** **0.002**



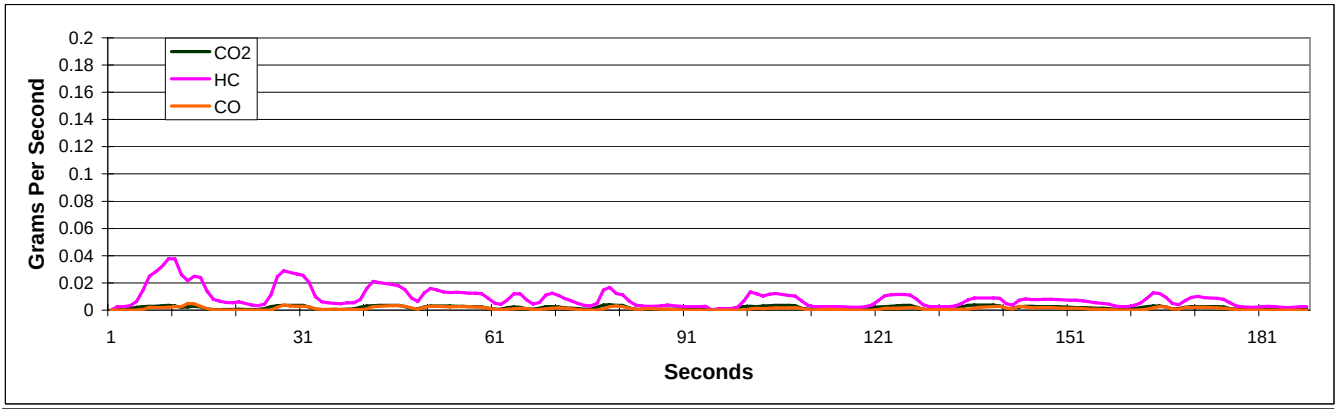


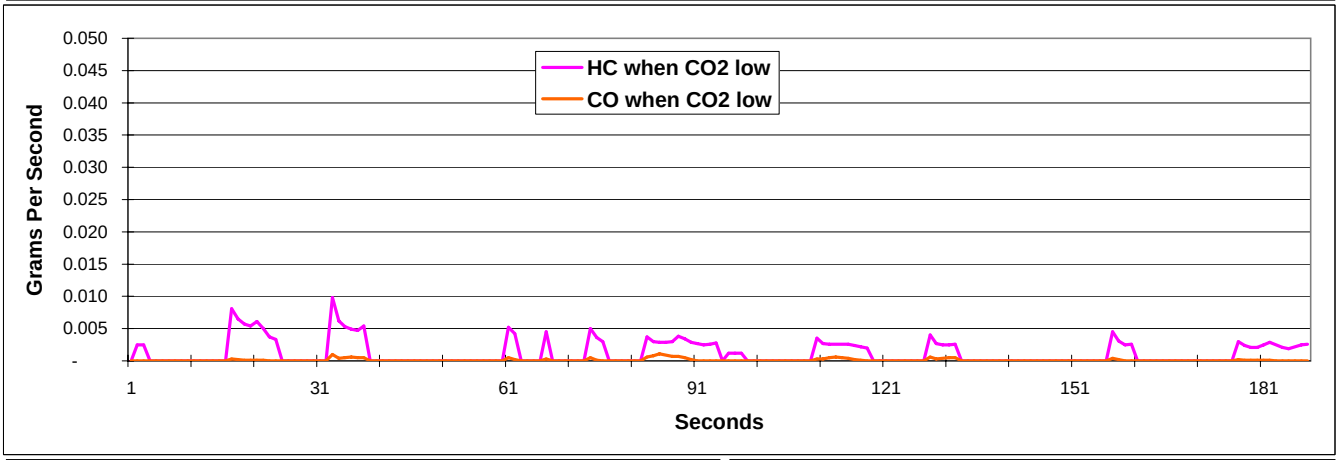


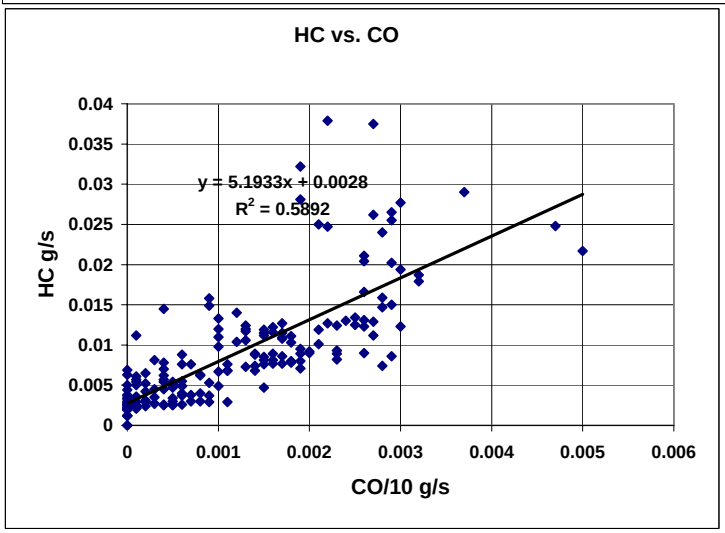


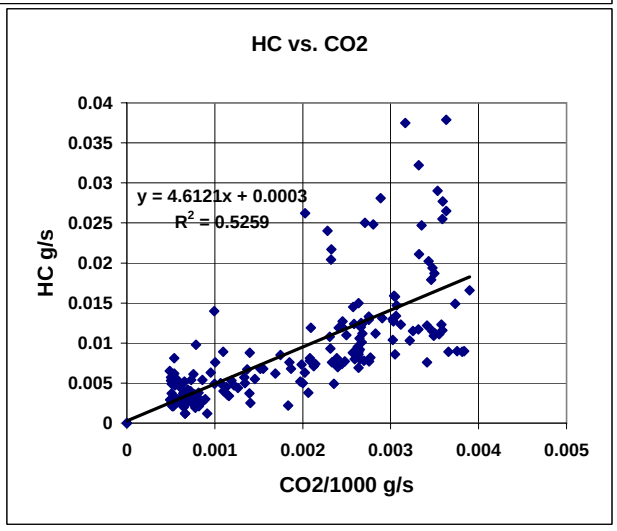
Ref: 91				**Leak predicted:**	No
Cert: 3030568	**VIN:** 1FASP15JXSW101063		**Make:** FORD		
Year: 1995	**Model:** ESCORT		**HC g/mi:**	1.48	
	HCLP: Yes		**CO g/mi:**	1.95	
	Note: fuel tank top				

Avg HC when CO2 low g/s:		**0.003**	**Stdev %:**	**48%**	**Avg HC-$HC_{CO:}$**	**0.003**		
HC vs. CO:	**A:**	**5.19**	**B:**	**0.003**	**R^2:**	**0.59**	**Stdev HC-$HC_{CO:}$**	**0.005**
HC vs. CO2	**A:**	**4.61**	**B:**	**0.000**	**R^2:**	**0.53**	**Stdev HC-$HC_{CO2:}$**	**0.005**



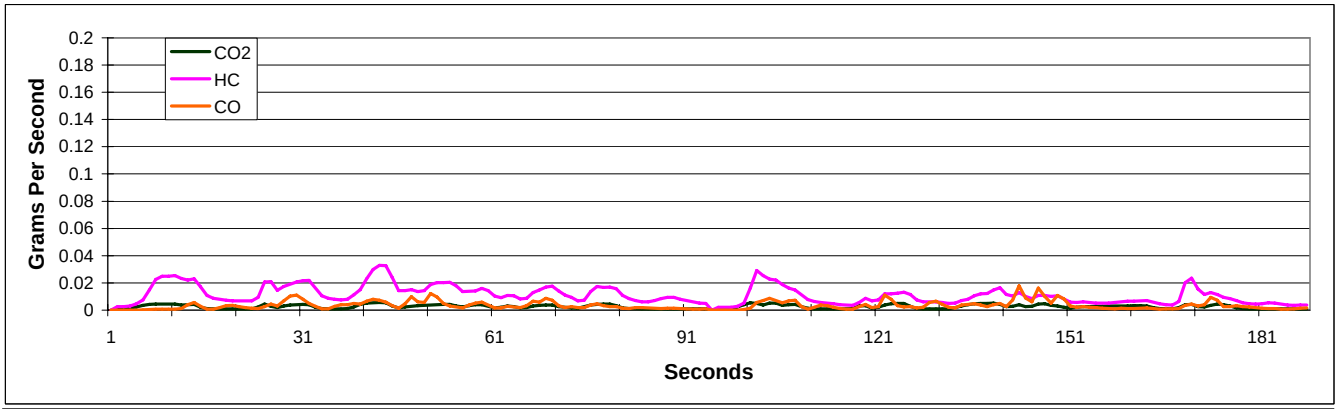


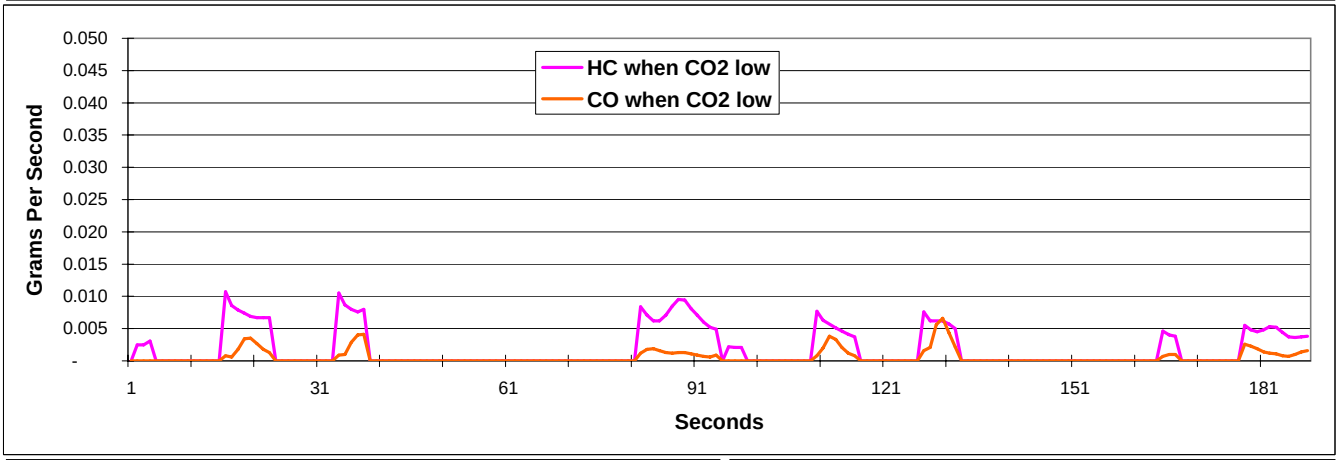


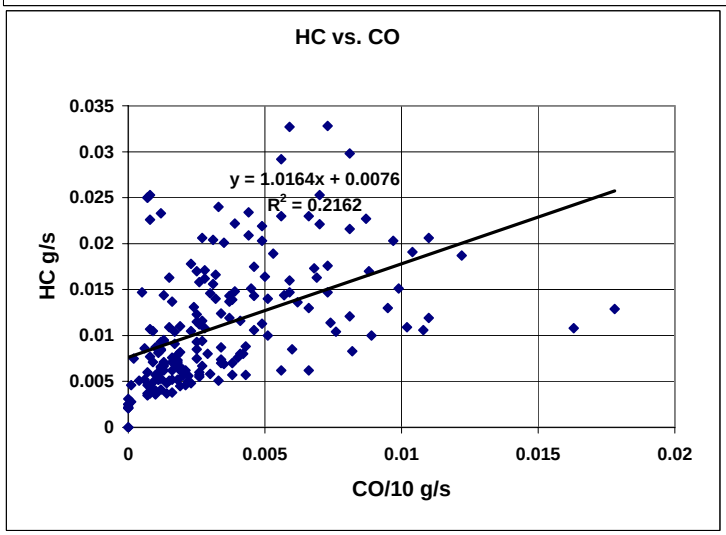


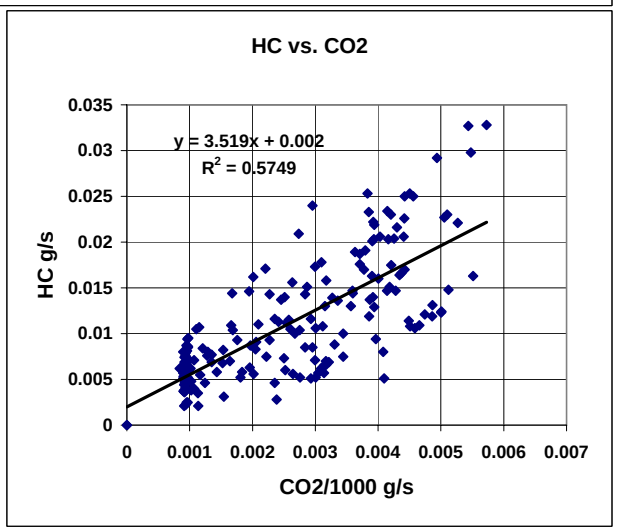
Ref: 92				Leak predicted:	No
Cert: 3030569	VIN: 2MELM75W5PX653327		Make: MERC		
Year: 1993	Model: GRAND		HC g/mi:	1.87	
	HCLP: No		CO g/mi:	5.77	
	Note: (oil burner)				

Avg HC when CO2 low g/s:	0.006	Stdev %:	36%	Avg HC-$HC_{CO:}$	0.008		
HC vs. CO:	A:	1.02	B:	0.008	R^2:	0.22	Stdev HC-$HC_{CO:}$ 0.006
HC vs. CO2	A:	3.52	B:	0.002	R^2:	0.57	Stdev HC-$HC_{CO2:}$ 0.004



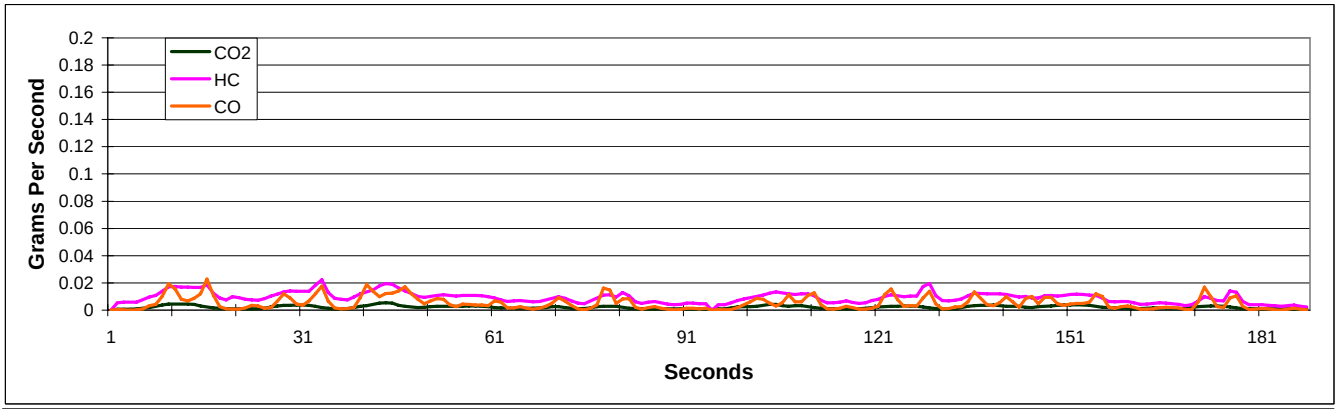


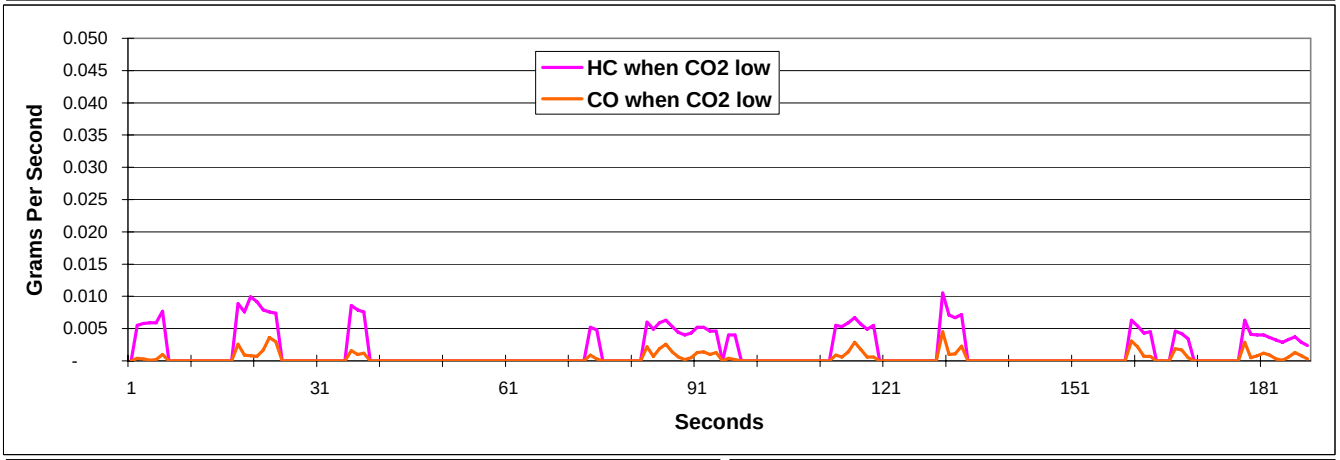


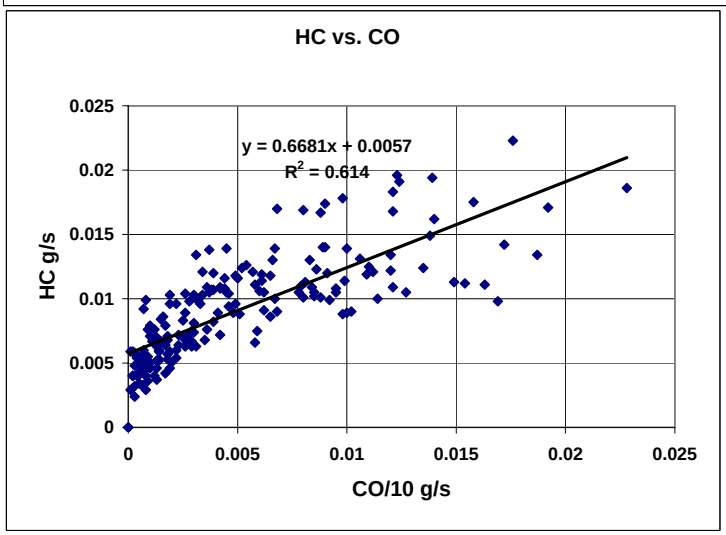


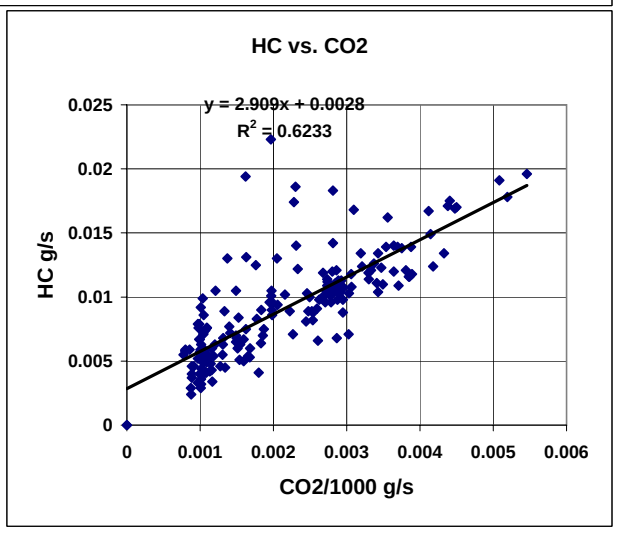
Ref: 93				Leak predicted:	No
Cert: 3030574	VIN: 1G2WH54T9PF275155		Make: PONT		
Year: 1993	Model: GRAND			HC g/mi:	1.55
	HCLP: Yes			CO g/mi:	8.61
	Note: filler neck / fuel tank top				

Avg HC when CO2 low g/s:	0.005	Stdev %:	36%	Avg HC-$HC_{CO:}$	0.006		
HC vs. CO:	A:	0.67	B:	0.006	R^2:	0.61	Stdev HC-$HC_{CO:}$ 0.003
HC vs. CO2	A:	2.91	B:	0.003	R^2:	0.62	Stdev HC-$HC_{CO2:}$ 0.002



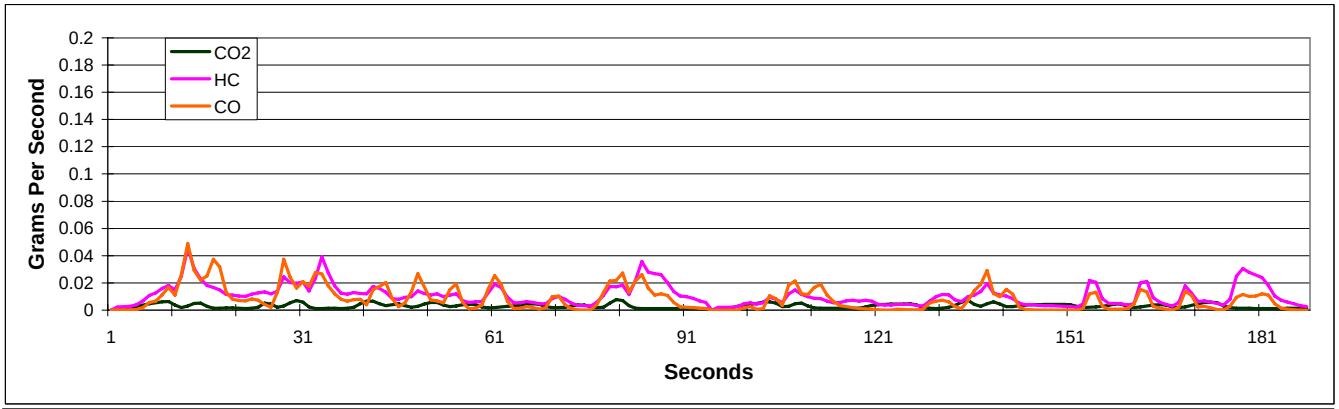


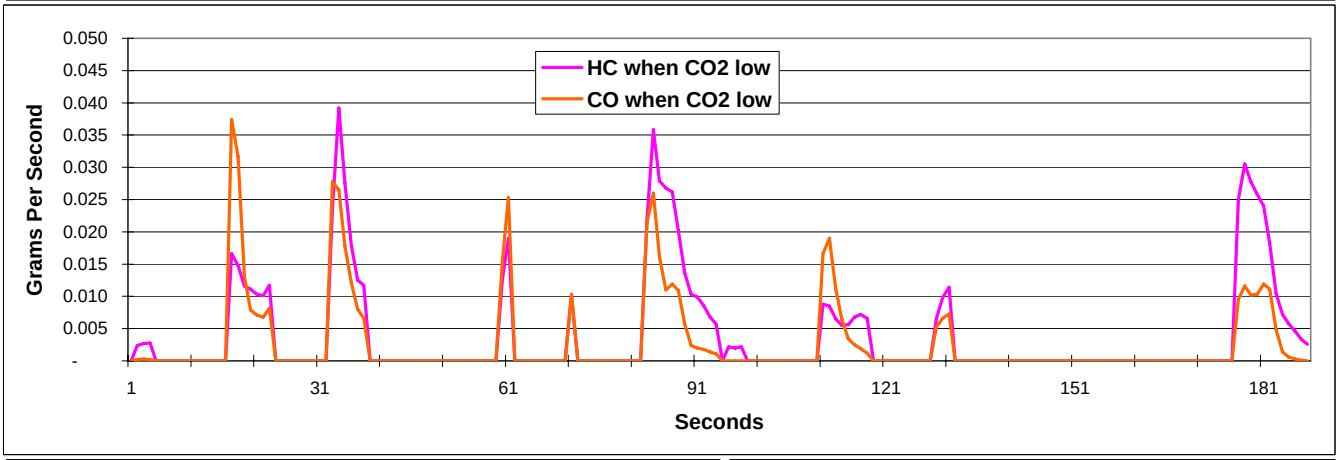


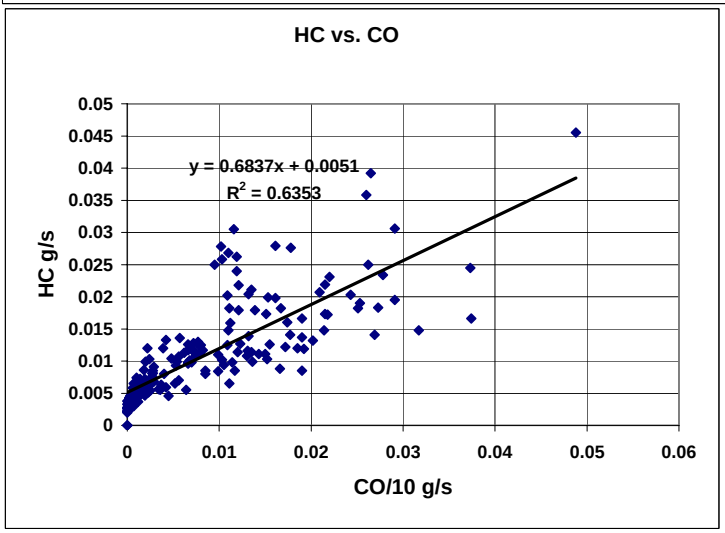


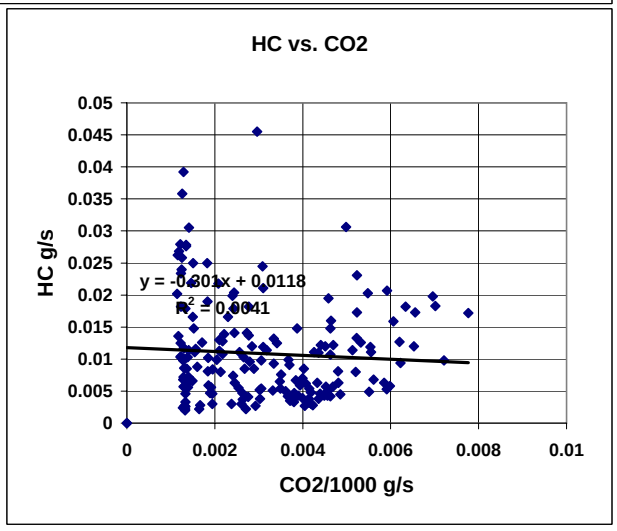
Ref: 94				**Leak predicted:**	Yes
Cert: 3030582	**VIN:** 1LNBM93EXKY614501		**Make:** LINC		
Year: 1989	**Model:** CONTIN			**HC g/mi:**	1.85
	HCLP: Yes			**CO g/mi:**	14.29
	Note: filler neck / fuel tank top - tighten cap - gone				

Avg HC when CO2 low g/s:	0.014	**Stdev %:**	68%	**Avg HC-$HC_{CO:}$**	0.005		
HC vs. CO:	**A:** 0.68	**B:**	0.005	**R^2:**	0.64	**Stdev HC-$HC_{CO:}$**	0.005
HC vs. CO2	**A:** (0.30)	**B:**	0.012	**R^2:**	0.00	**Stdev HC-$HC_{CO2:}$**	0.008



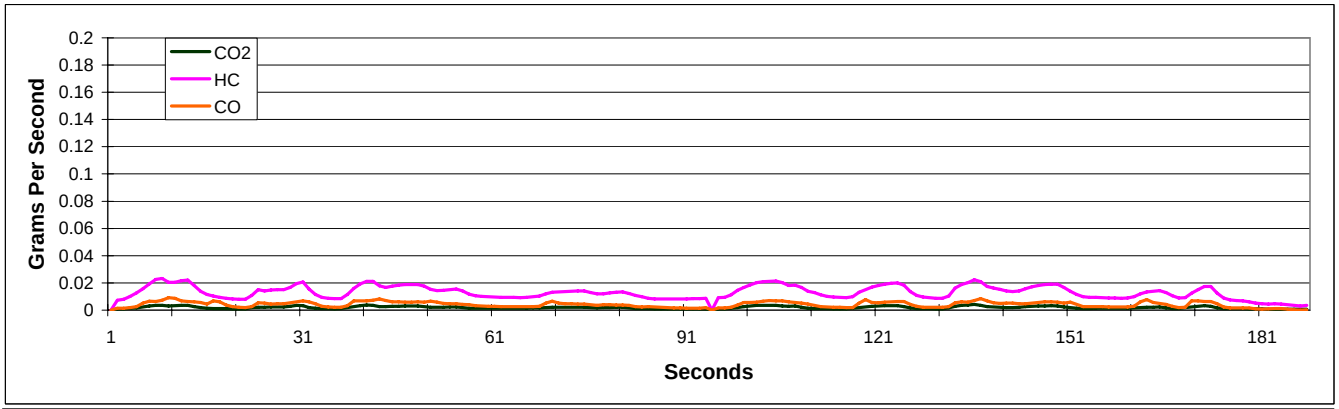


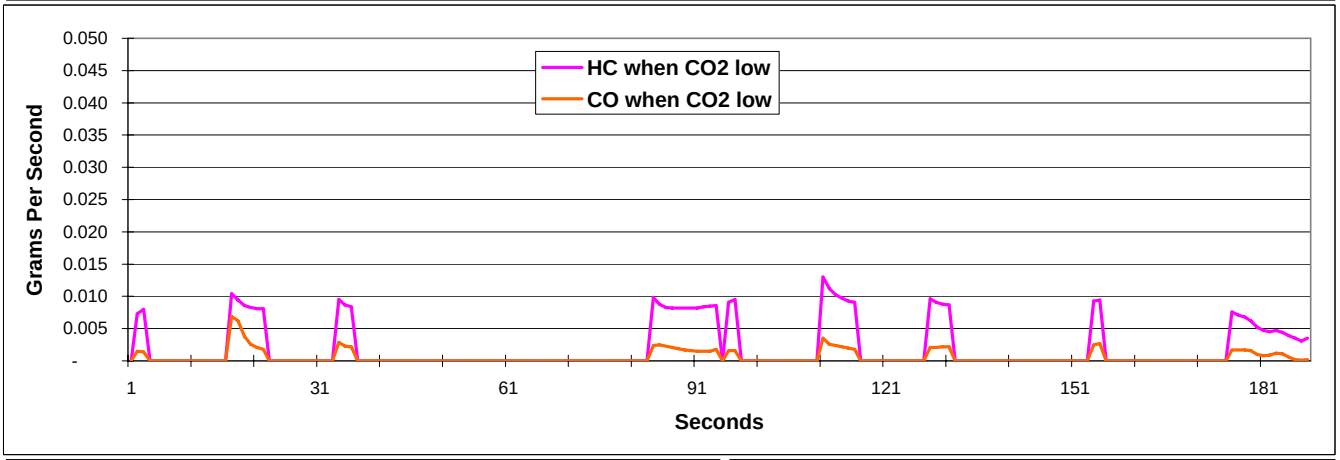


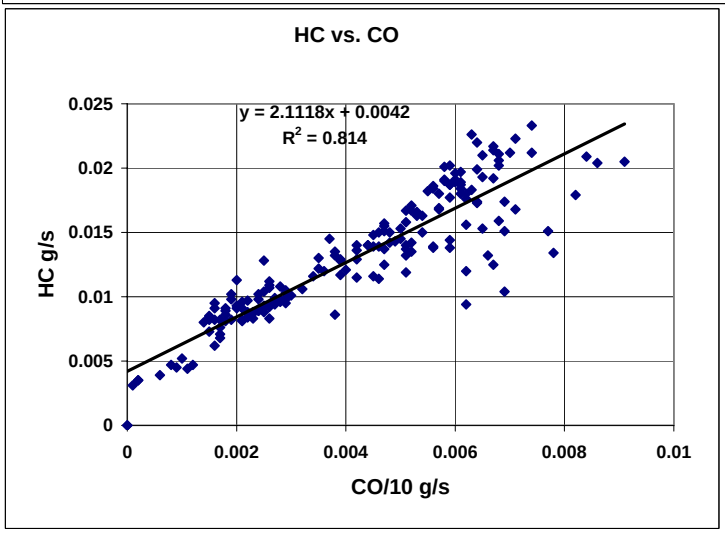


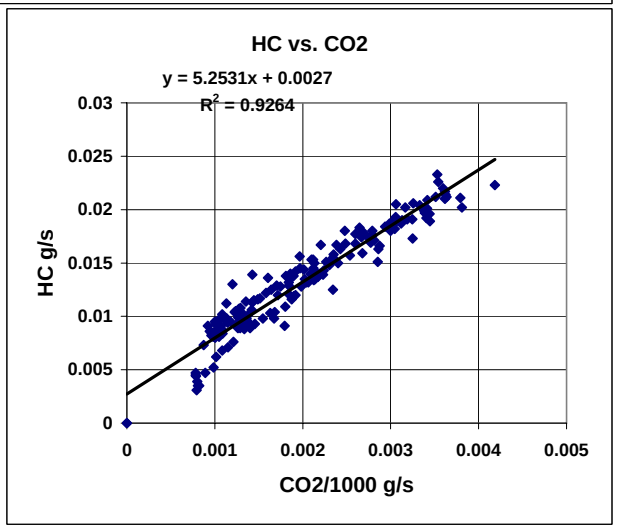
Ref: 95				**Leak predicted:**	No
Cert: 3030586	**VIN:** 1G1JC5440P7249477		**Make:** CHEV		
Year: 1993	**Model:** CAVALI			**HC g/mi:**	2.11
	HCLP: Yes			**CO g/mi:**	6.74
	Note: canister				

Avg HC when CO2 low g/s:		**0.008**	**Stdev %:**	**31%**	**Avg HC-$HC_{CO:}$**	**0.004**	
HC vs. CO:	**A:**	**2.11**	**B:**	**0.004**	**R^2:**	**0.81**	**Stdev HC-$HC_{CO:}$** **0.002**
HC vs. CO2	**A:**	**5.25**	**B:**	**0.003**	**R^2:**	**0.93**	**Stdev HC-$HC_{CO2:}$** **0.001**



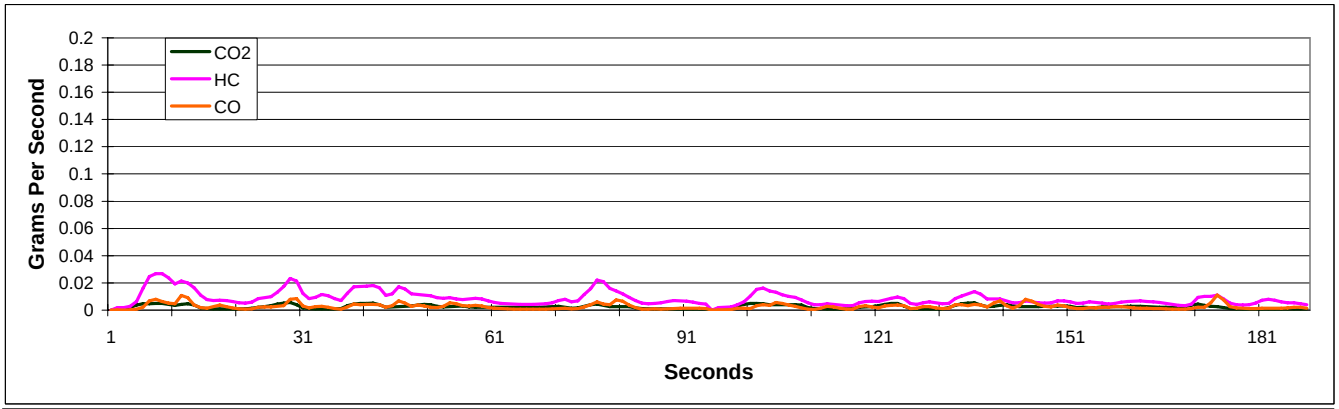


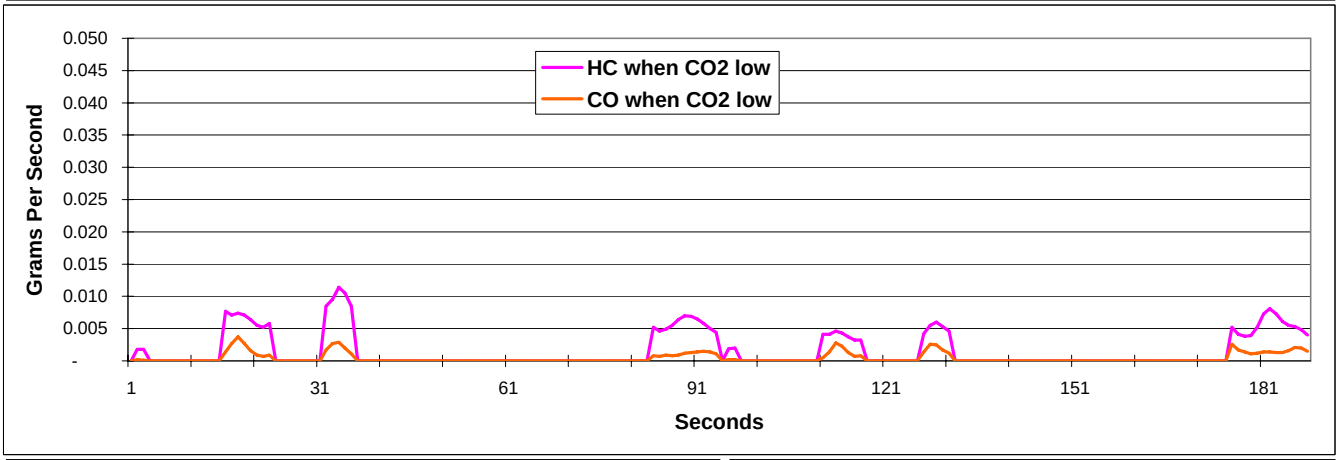


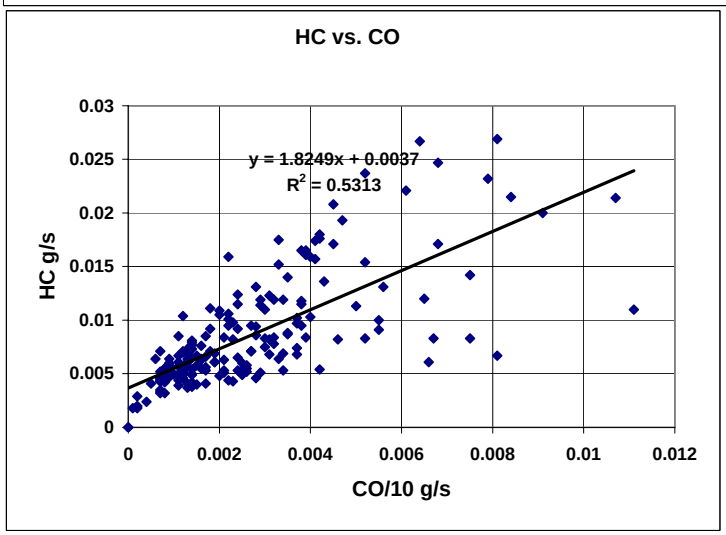


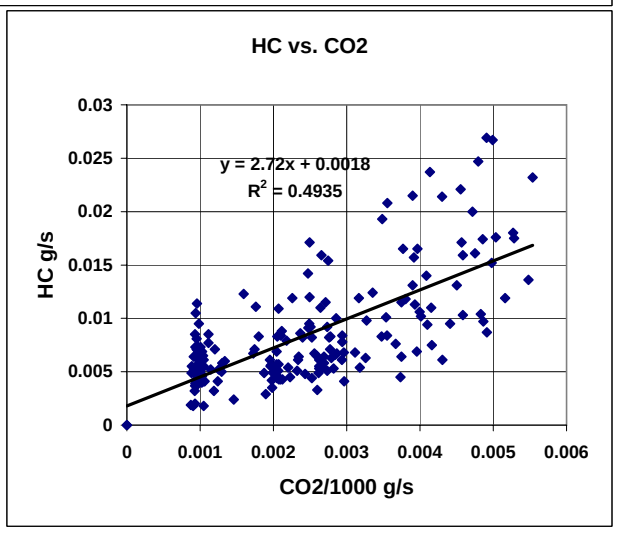
Ref: 97				Leak predicted:	No
Cert: 3030590	VIN: 1LNLM82W0PY601336		Make: LINC		
Year: 1993	Model: TOWN C		HC g/mi:	1.41	
	HCLP: No		CO g/mi:	4.38	
	Note: 0				

Avg HC when CO2 low g/s:	0.006	Stdev %:	37%	Avg HC-$HC_{CO:}$	0.004		
HC vs. CO:	A:	1.82	B:	0.004	R^2:	0.53	Stdev HC-$HC_{CO:}$ 0.004
HC vs. CO2	A:	2.72	B:	0.002	R^2:	0.49	Stdev HC-$HC_{CO2:}$ 0.004



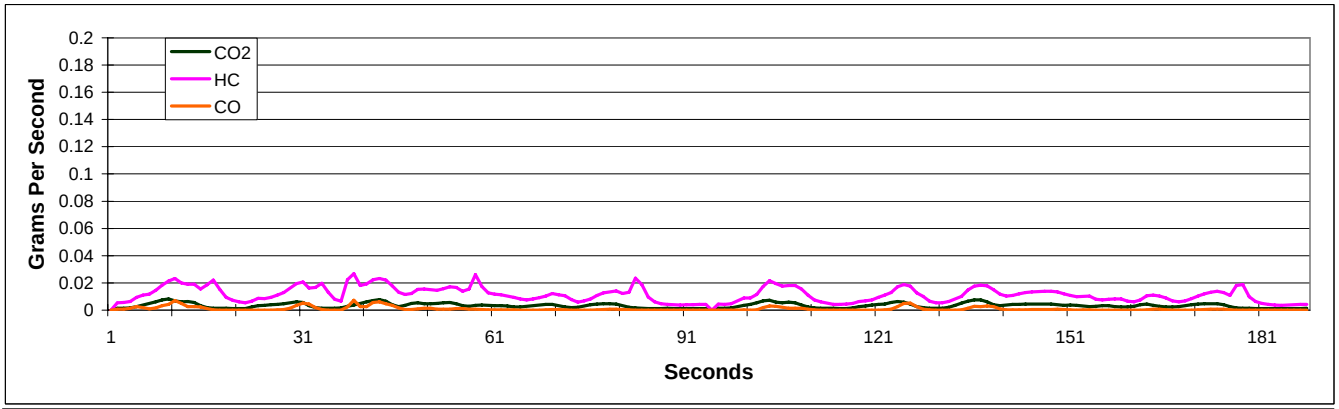


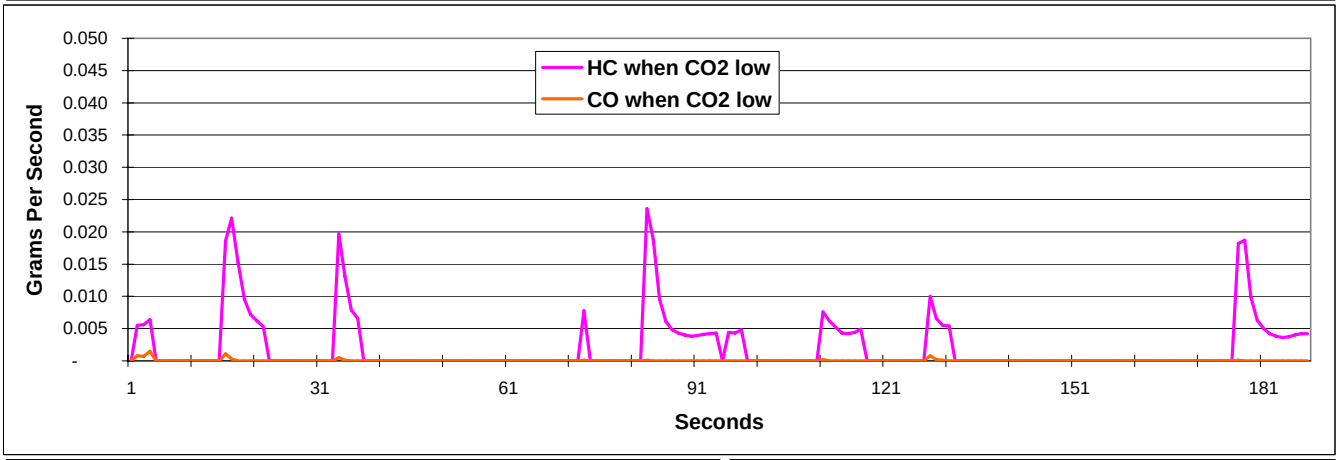


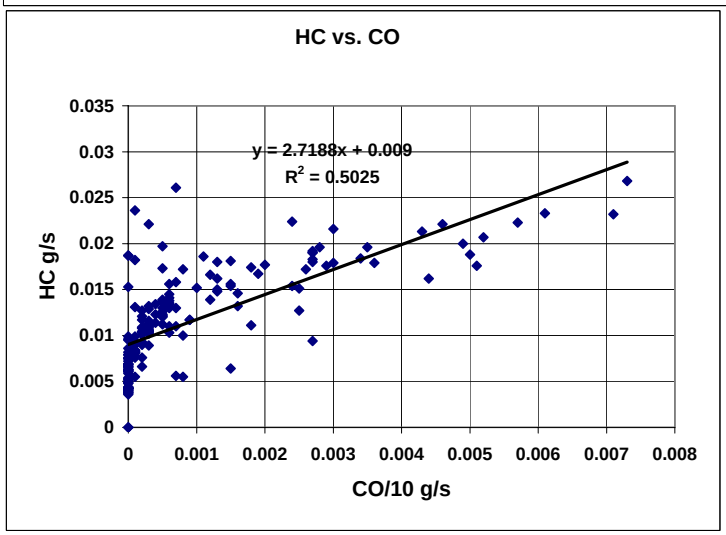


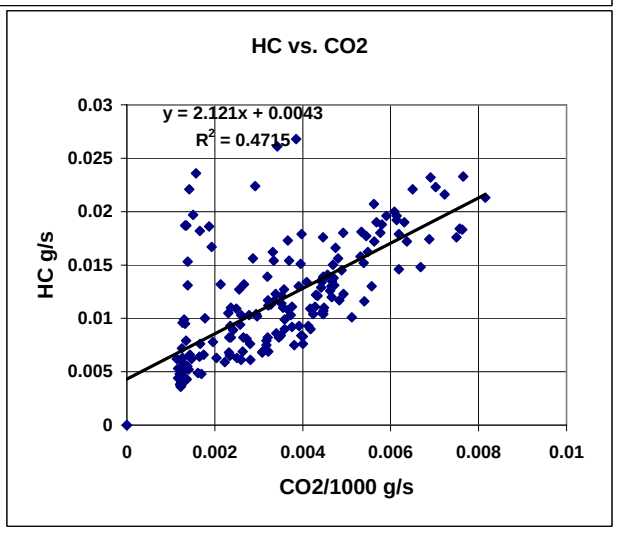
Ref:	**98**			**Leak predicted:**	**No**
Cert:	**3030793**	**VIN:**	**1FTDF15Y9SLB27514**	**Make:**	**FORD**
Year:	**1995**	**Model:**	**F150 R**	**HC g/mi:**	**1.92**
		HCLP:	**No**	**CO g/mi:**	**1.49**
		Note:	**0**		

Avg HC when CO2 low g/s:		**0.008**	**Stdev %:**	**72%**	**Avg HC-$HC_{CO:}$**	**0.009**	
HC vs. CO:	**A:**	**2.72**	**B:**	**0.009**	**R^2:**	**0.50**	**Stdev HC-$HC_{CO:}$** **0.004**
HC vs. CO2	**A:**	**2.12**	**B:**	**0.004**	**R^2:**	**0.47**	**Stdev HC-$HC_{CO2:}$** **0.004**



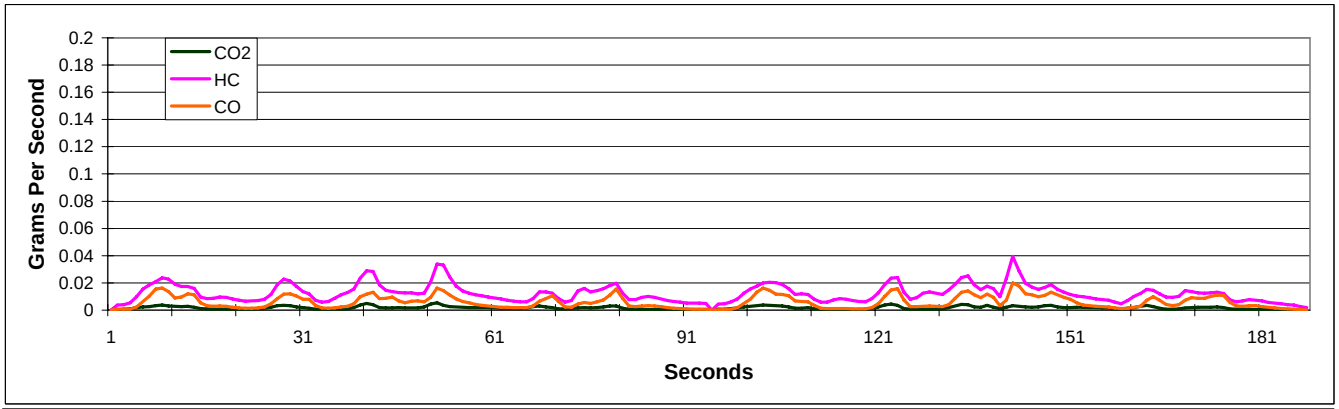


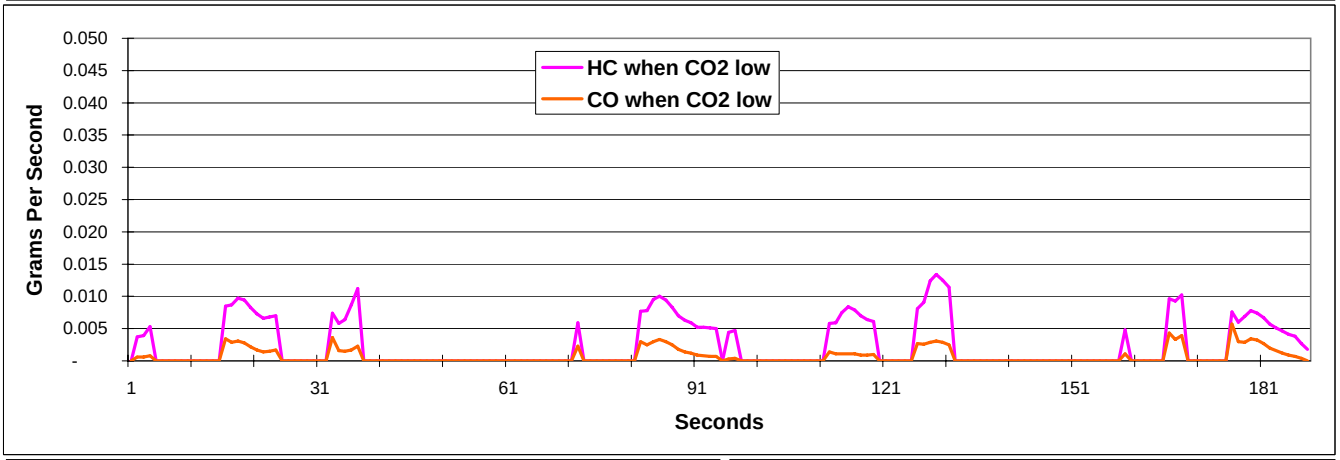


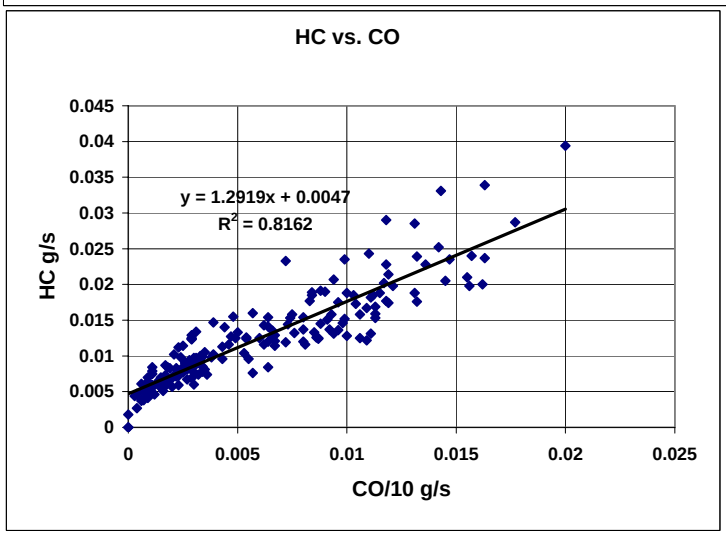


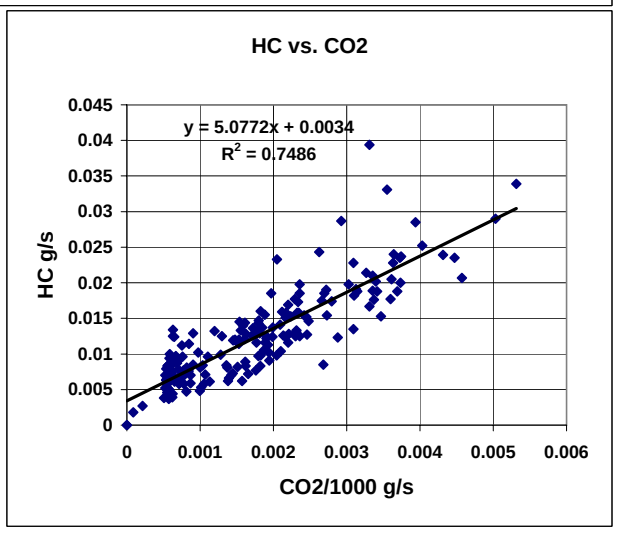
Ref: 96				Leak predicted:	No
Cert: 3031922	VIN: 1HGCB7251MA056023		Make: HOND		
Year: 1991	Model: ACCORD			HC g/mi:	2.06
	HCLP: No			CO g/mi:	9.88
	Note: 0				

Avg HC when CO2 low g/s:	0.007	Stdev %:	35%	Avg HC-$HC_{CO:}$	0.005		
HC vs. CO:	A:	1.29	B:	0.005	R^2:	0.82	Stdev HC-$HC_{CO:}$ 0.003
HC vs. CO2	A:	5.08	B:	0.003	R^2:	0.75	Stdev HC-$HC_{CO2:}$ 0.003



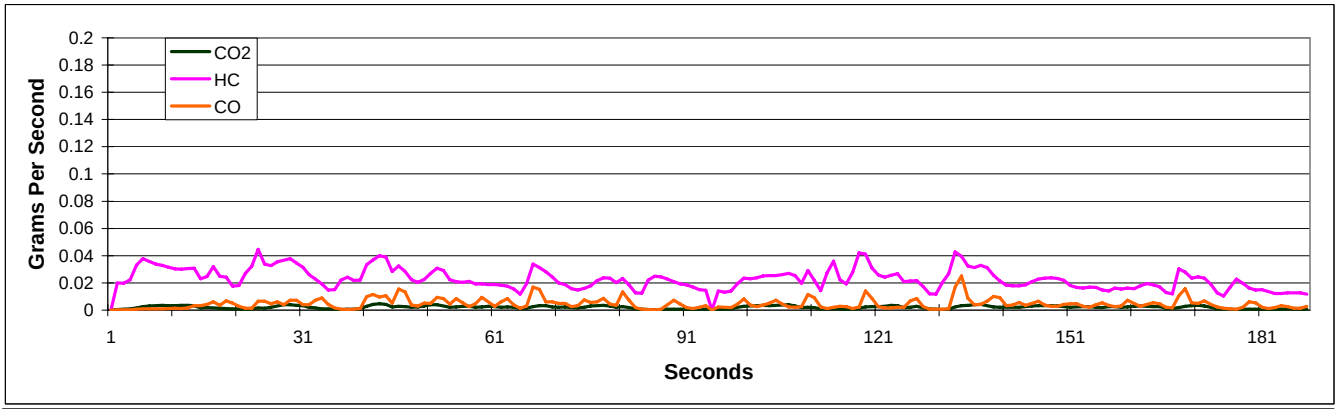


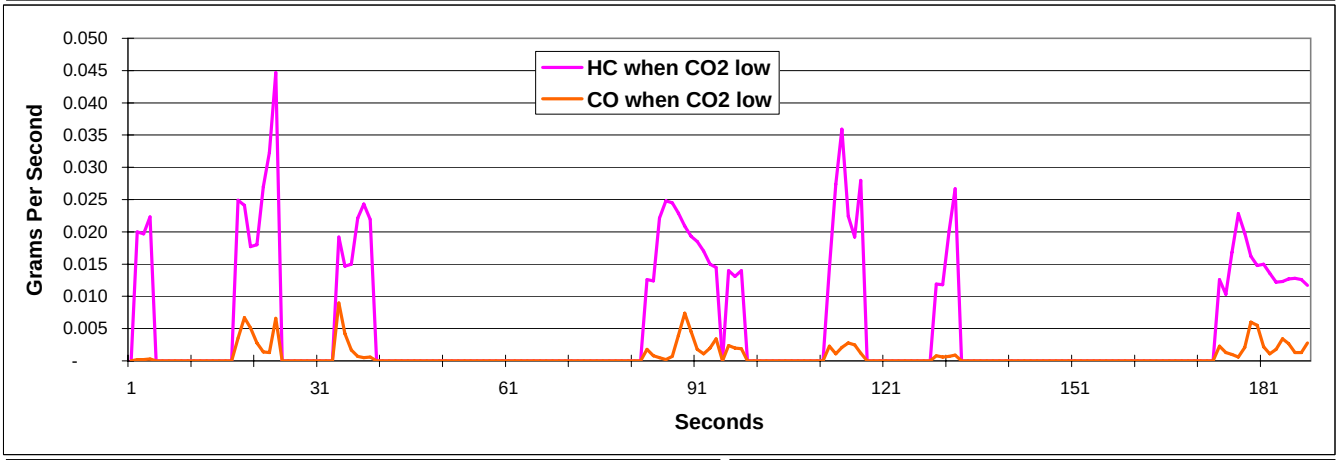


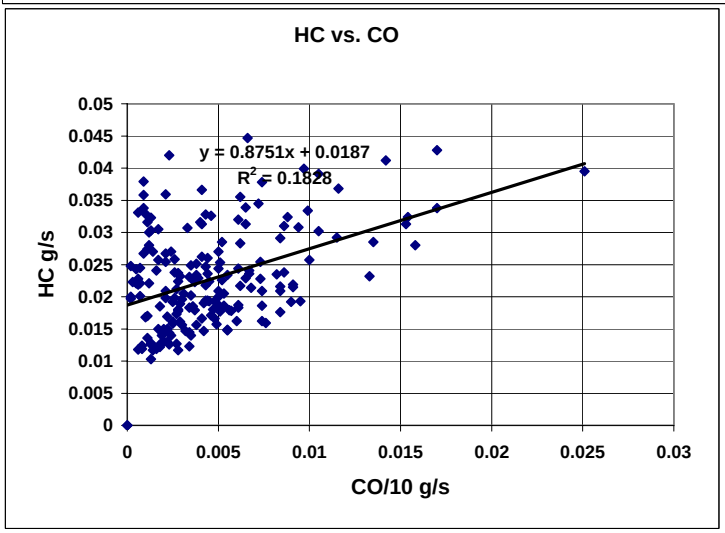


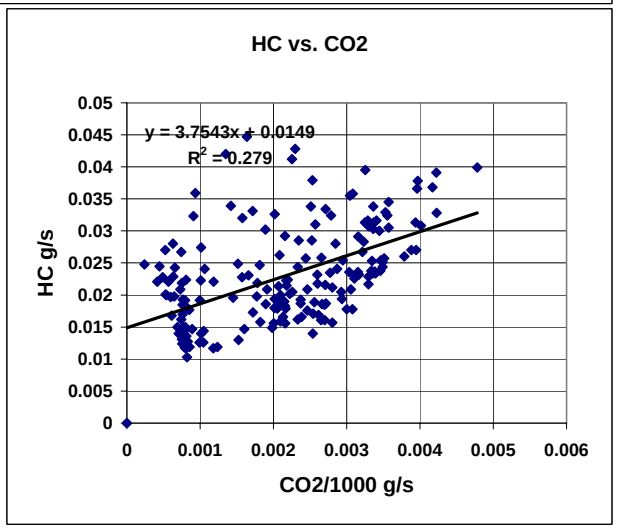
Ref: 99				Leak predicted:	Yes
Cert: 3030798	VIN: WDB1070421A019304		Make: MERZ		
Year: 1985	Model: 280 SE			HC g/mi:	3.80
	HCLP: No			CO g/mi:	7.67
	Note: 0				

Avg HC when CO2 low g/s:	0.019	Stdev %:	39%	Avg HC-HC_{CO_2}:	0.019		
HC vs. CO:	A:	0.88	B:	0.019	R^2:	0.18	Stdev HC-HC_{CO_2}:	0.007
HC vs. CO2	A:	3.75	B:	0.015	R^2:	0.28	Stdev HC-HC_{CO_2}:	0.007



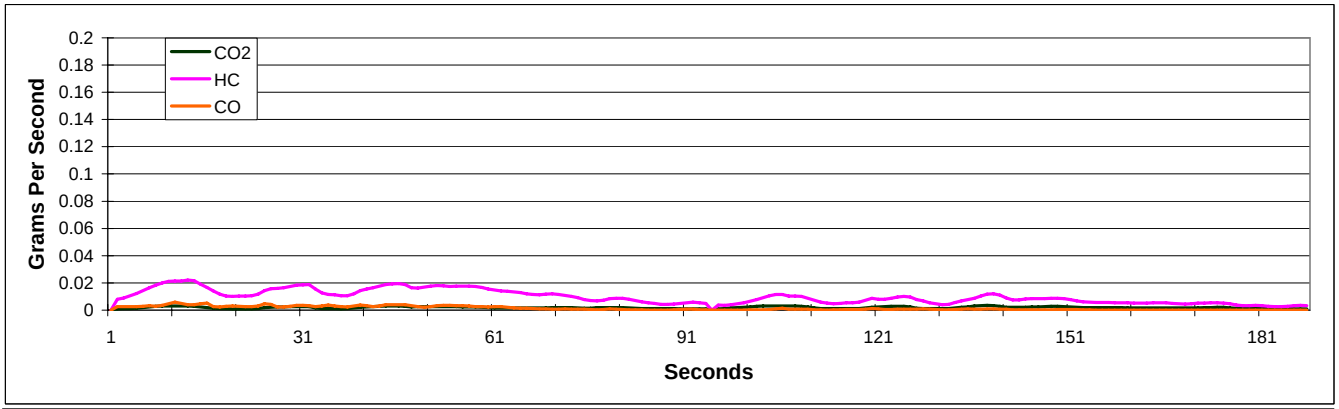


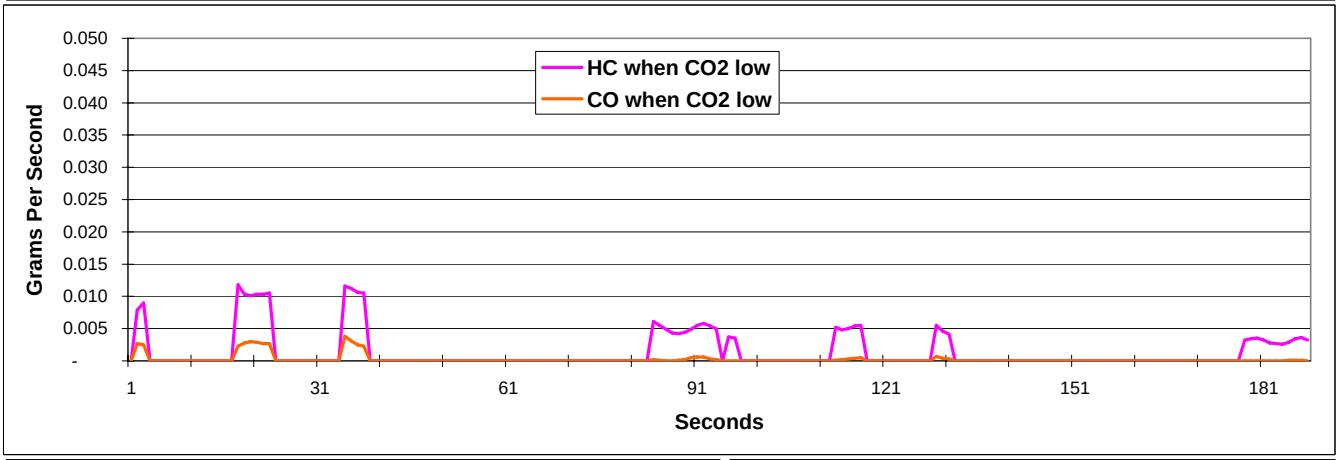


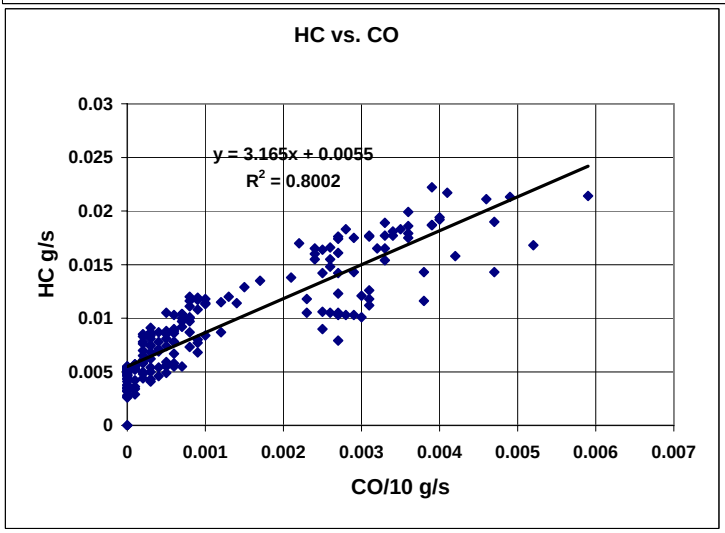


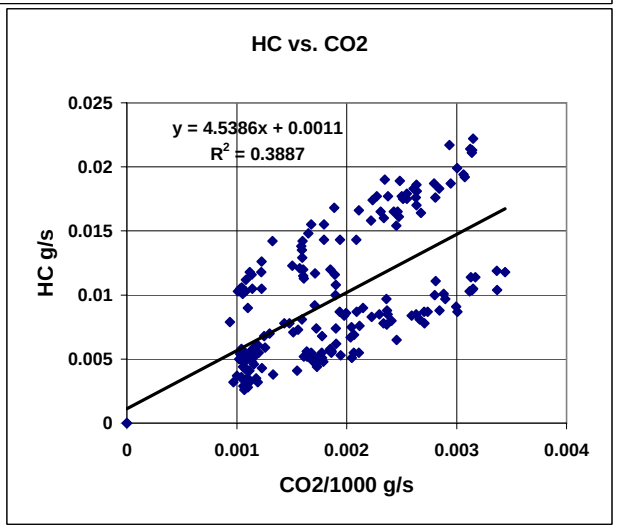
Ref:	**100**			**Leak predicted:**	**No**
Cert:	**3030447**	**VIN:**	**1G1JC1444P7112406**	**Make:**	**CHEV**
Year:	**1993**	**Model:**	**CAVALI**	**HC g/mi:**	**1.65**
		HCLP:	**Yes**	**CO g/mi:**	**2.25**
		Note:	**rusted tank**		

Avg HC when CO2 low g/s:		**0.006**	**Stdev %:**	**53%**	**Avg HC-$HC_{CO:}$**	**0.006**	
HC vs. CO:	**A:**	**3.16**	**B:**	**0.006**	**R^2:**	**0.80**	**Stdev HC-$HC_{CO:}$** **0.002**
HC vs. CO2	**A:**	**4.54**	**B:**	**0.001**	**R^2:**	**0.39**	**Stdev HC-$HC_{CO2:}$** **0.004**









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[3] E-35 Measurement of Running Loss Emissions in In-Use Vehicles (CRC Report No. 611) Automotive Testing Laboratories (February 1998) PB99158024

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