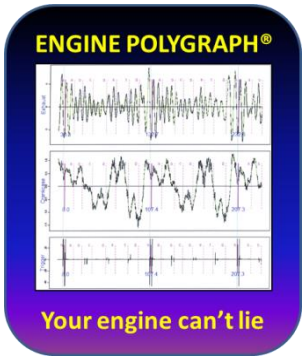
Predictive Fleet Technologies



Engine Polygraph™

And

Engine Angel™

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Problem: OBD is insufficient

1. On-Board Diagnostics (OBD) do not “see” many mechanical faults with the engine and cannot detect “dirty” engine conditions.

2. Anywhere from 37% to 60% of parts sent back under warranty repair are not defective (No Fault Found –NFF).

3. Oil and fuel additive manufacturers lack reliable methods of proving their products actually work.

4. No simple, fast, accurate and affordable method for assessing engine “health” exists.

The Solution is Engine Polygraph™

1. Two Piezoelectric Pressure Pulse sensors and the proper analytical software provides an accurate, reliable assessment of engine health.

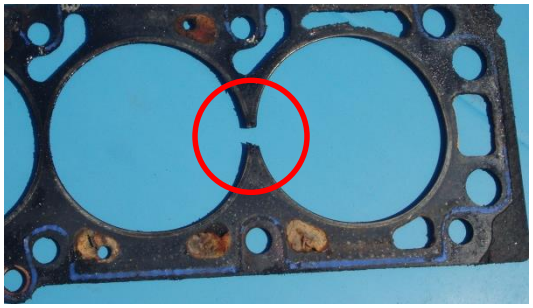
2. Works by analyzing the pressure waves generated by the engine when running, sampling over 40,000 times each second.

3. The most minute changes in engine condition become observable.

4. Detects issues On Board Diagnostic sensors cannot.

Exhaust

Oil Dipstick Tube

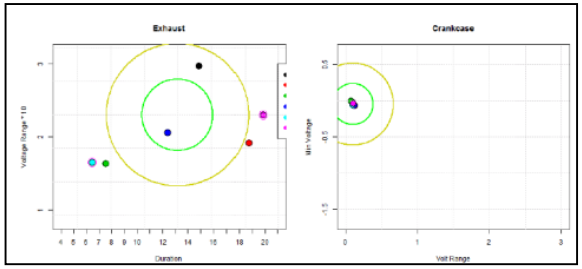


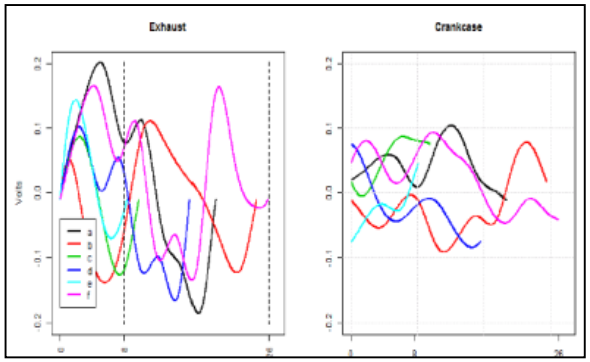
Engine Polygraph - Visible Results

252,000 miles - untreated

Upper Engine	5
Lower Engine	3
Volumetric Eff. Score	9
Valve Seating	1
Warnings	
High differences between cycles	
Low exhaust pressure. Check leakage	

1 2 3 4 5 6 7 8 9 10

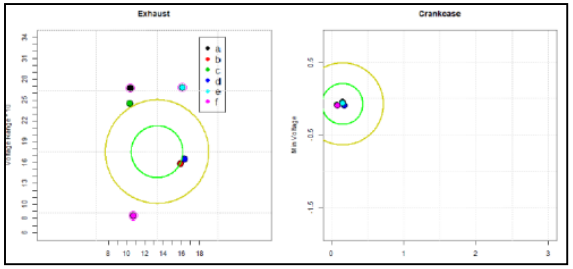


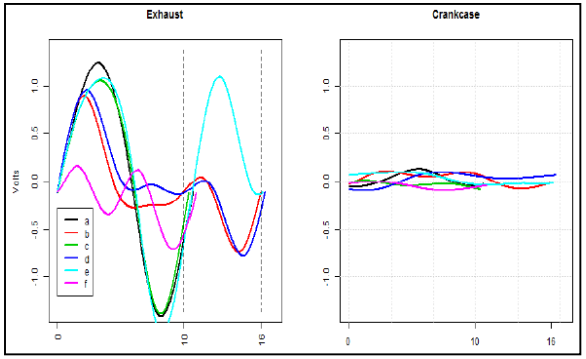


257,000 miles - Oxytane

Upper Engine	5
Lower Engine	3
Volumetric Eff. Score	5
Valve Seating	1
Warnings	
Low exhaust pressure. Check leakage	

1 2 3 4 5 6 7 8 9 10

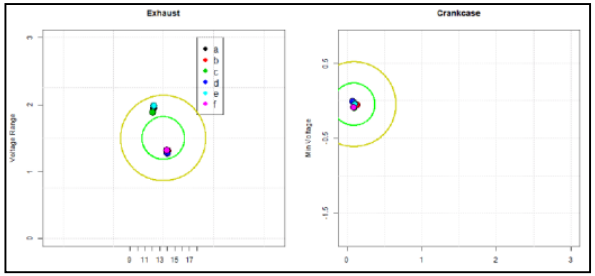


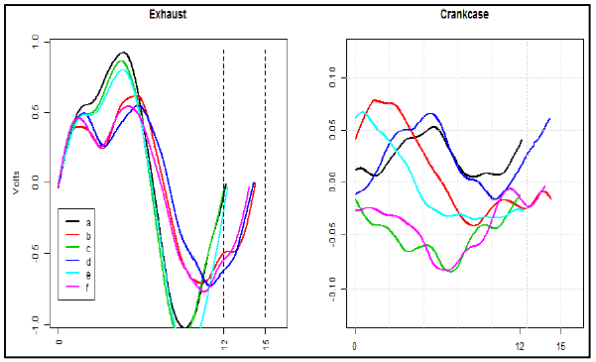


269,000 miles – Oxytane + RVS

Upper Engine	2
Lower Engine	3
Volumetric Eff. Score	1
Valve Seating	1
Warnings	
Low exhaust pressure. Check leakage	

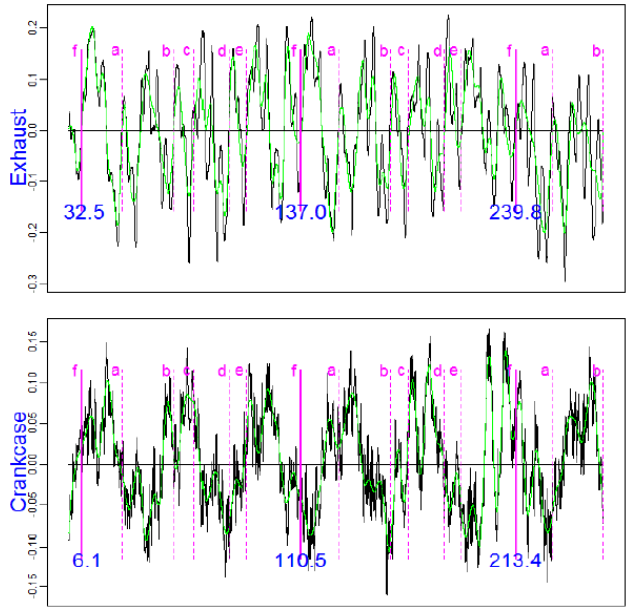
1 2 3 4 5 6 7 8 9 10



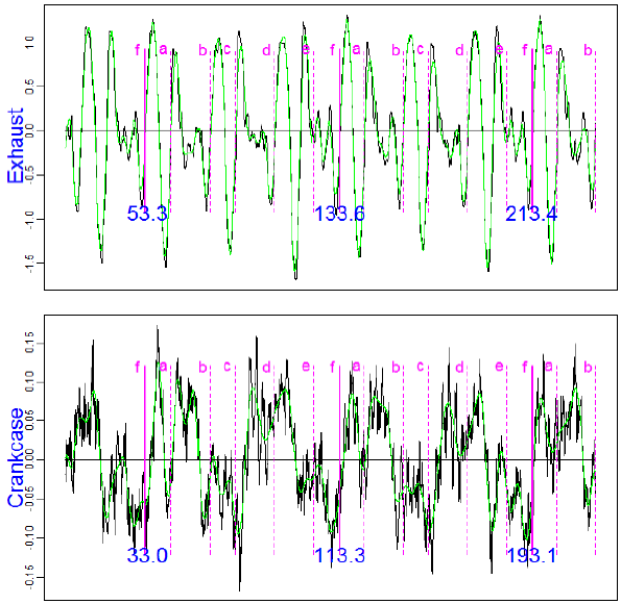


Engine Polygraph - Waveform Changes

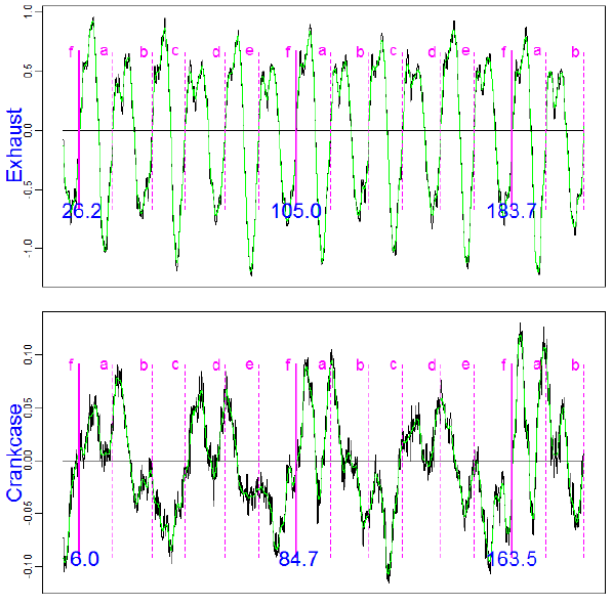
252,000 miles - untreated



257,000 miles - Oxytane



269,000 miles – Oxytane + RVS



Faster Problem Diagnosis

1. Currently provide numeric score to indicate severity
2. Pending implementation of descriptive text for Issue, Possible Cause and Recommended Fix.
3. Addition of graphics to assist the mechanic in fault diagnosis, such as Engine Block diagram, firing order, adjacency matrix, and cylinder offset diagram.
4. Quickly isolate mechanical problems from electrical problems.
5. Confirm proper operation upon completion of a repair/rebuild.
6. Rapid compression test (relative compression)

What can we detect?

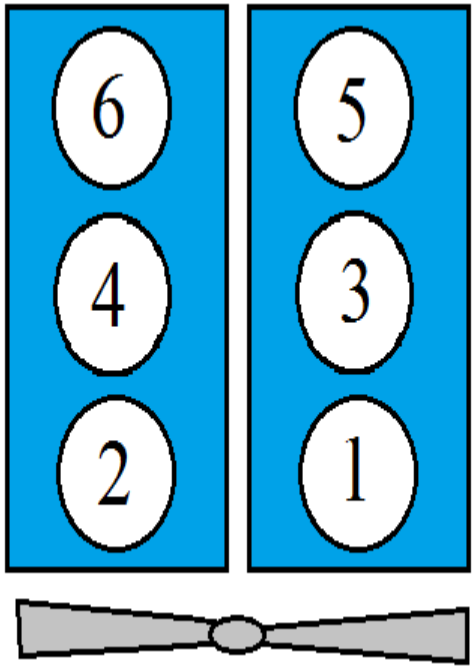
1. Valve Seating
2. Broken Valve Spring

3. Torn or damaged head gasket
4. Weak or broken fuel injector

5. Worn or rough cam lobe surface
6. Blow-by during compression stroke or intake stroke
7. Scraping of crankcase components (piston rings against cylinder wall)
8. Mis-fire with fuel
9. Mis-fire without fuel

Engine Block, AdjacencyMatrix, FiringSequence

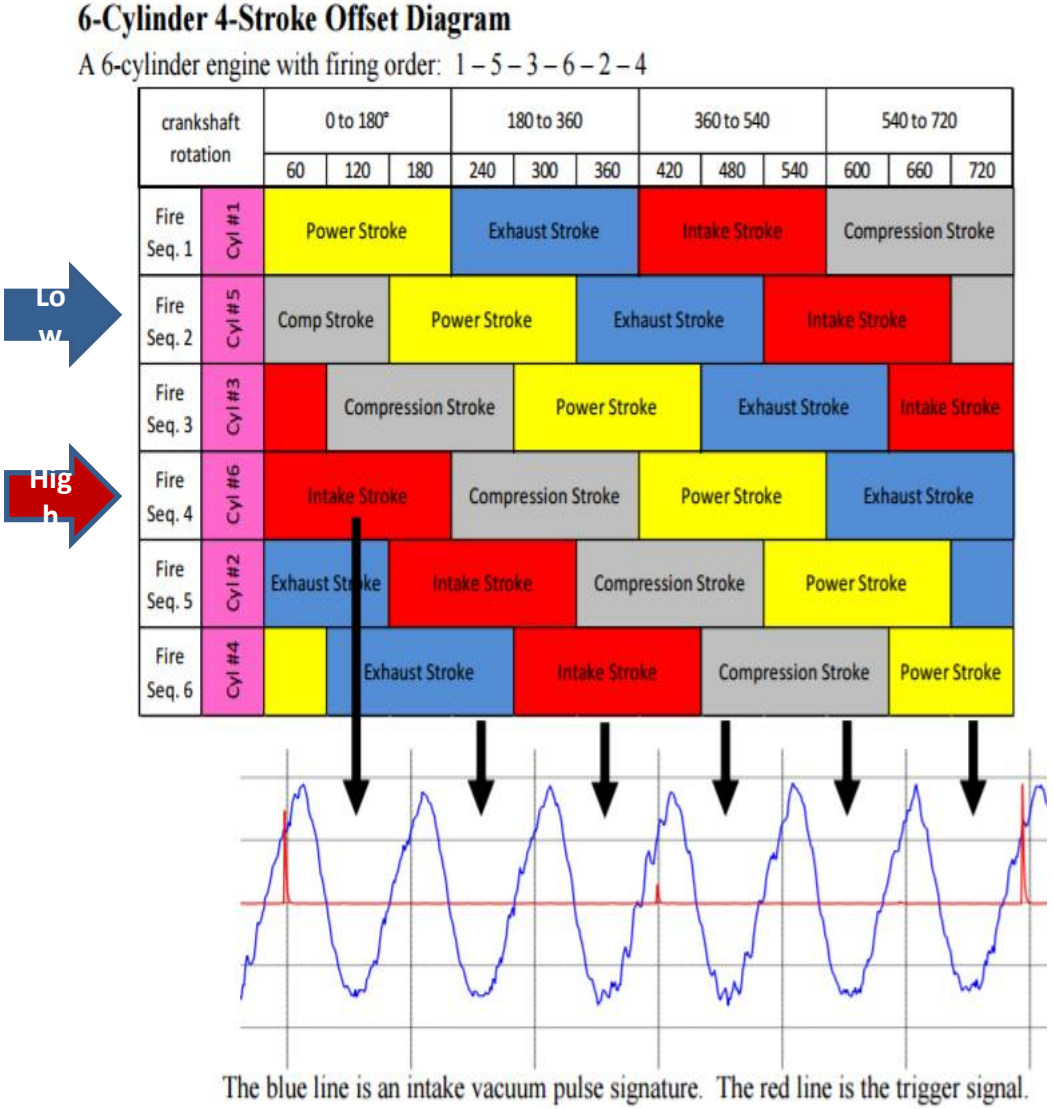
V6 Right Alt :



Firing Seq: 1-2-3-4-5-6

Cylinder	Adj1	Adj2
1	3	
2	4	
3	1	5
4	2	6
5	3	
6	4	

Cylinder Offset Diagram



The blue line is an intake vacuum pulse signature. The red line is the trigger signal.

	trigger pulse	+1	+2	+3		
Exhaust pulses	#2 exhaust	#4 exhaust	#1 exhaust	#5 exhaust	#3 exhaust	#6 exhaust
Crankcase pulses	#1 crankcase	#5 crankcase	#3 crankcase	#6 crankcase	#2 crankcase	#4 crankcase
intake vacuum pulses	#6 intake	#2 intake	#4 intake	#1 intake	#5 intake	#3 intake

Value Proposition

1. **Maintenance Shop**
    a. Revenue stream from Assessment fees
    b. Decreased diagnostic time
    c. “New” cutting-edge capability
    d. Risk reduction – demonstrate repair efficacy (Before/After)

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