

What Engine Polygraph sees in a Nearly Perfect Engine

2017-02-21

Background

- It might be easiest to explain some features of the Engine Polygraph Assessment report with a good engine, before we delve into more complex questions related to component wear, carbon buildup, and failure.
- Here is a 'new' (about 400 miles) Ford Mustang with a 2.4L Duratec I4 engine.
- Some new engines are not this 'good'.
- Some well-maintained engines stay like this for years.

Engine and Test Conditions

**Vehicle ID : Ford
Mustang**

Assessment

1

The Assessment score is shown as '1' in green. Our scores go from 1 (best) to 9 (very bad- red)

Here we show the Owner and Vehicle identification. The Engine information is from pull-down lists, first with Manufacturer, then with Engine model.

The next set of data is about this Vehicle at the time of the test: Odometer, Date, RPM (calculated), Coolant Temperature.

Then file names are displayed for future reference in the system. User comments are optional but can be useful in identifying the signature in the system in the future.

| | |
|-----------------------|---|
| Owner | Somebody |
| Serial Number | NA |
| Engine | Ford 2.3L Duratec I4 Ford (4 stroke, 4 cylinders) |
| Odometer | 400 |
| Date | 2017-02-21 12:00:00 AM |
| RPM | 893 |
| Engine Temperature | 120 F |
| Engine Polygraph name | 20170221-0001-Ford-Mustang-1500-1.psdata |
| User's file name | eb1f8f0a-4a98-4d18-bda9-c08de9f9dec2.psdata |
| User's comments | Ford Mustang test |

Results

cb1f8f0a-4a98-4d18-bda9-c08de9f9dec2

<http://www.EnginePolygraph.com>

Engine Polygraph Assessment

Version 5.0

This set of data shows the results of the mathematical analysis. The Upper Engine shows a '1', indicating that all cylinders are very similar in the pulse measured from the crankcase. Upper engine refers to exhaust valves, injectors, head gasket, clean manifold,...

The Lower Engine score is also a '1', indicating that the crankcase pulses for each cylinder are nearly identical. This means no noticeable blow-by, pistons, rings, cylinder sleeves, good PCV valve and intake valves (as seen through the PCV valve), ...

Volumetric Efficiency score is '1' indicating no noticeable turbulence in the exhaust manifold hindering air flow. Valve Seating is also a '1', indicating no carbon buildup blocking the tight closure of exhaust valves.

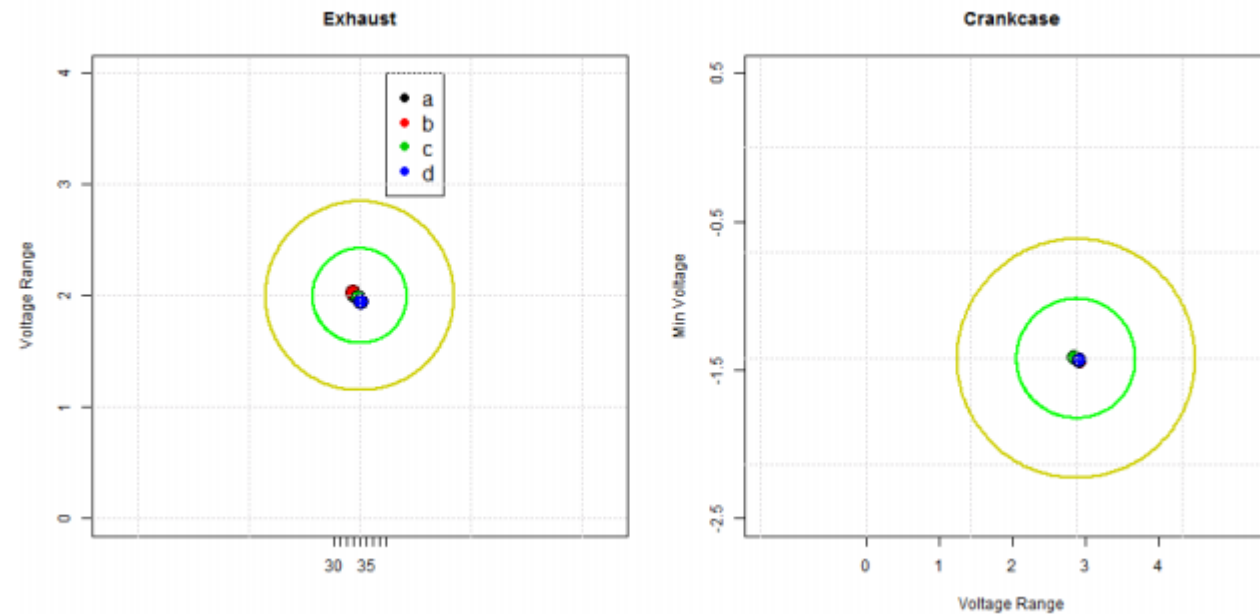
| | | | | | | | | | |
|-------------------------------------|---|---|---|---|---|---|---|---|----|
| Upper Engine | 1 | | | | | | | | |
| Lower Engine | 1 | | | | | | | | |
| Volumetric Eff. Score | 1 | | | | | | | | |
| Valve Seating | 1 | | | | | | | | |
| Warnings | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Low exhaust pressure. Check leakage | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Engine Integrity Diagram

The Engine Integrity Diagram shows almost no variation between key characteristics of the pressure pulses between the cylinders. If all cylinders are behaving nearly identically, the engine is running very well. (If all were very bad, the engine would not be running, which is the case when the engine is turned off.)

The scales on the Exhaust are: Vertical = Pressure (voltage) range and Horizontal = Duration of the pulse in ms.

The scales on the Crankcase graph are: Vertical = Minimum pressure (voltage); Horizontal = Pressure (voltage) range.



Polygraph Model

Vertical lines mark cylinder intervals

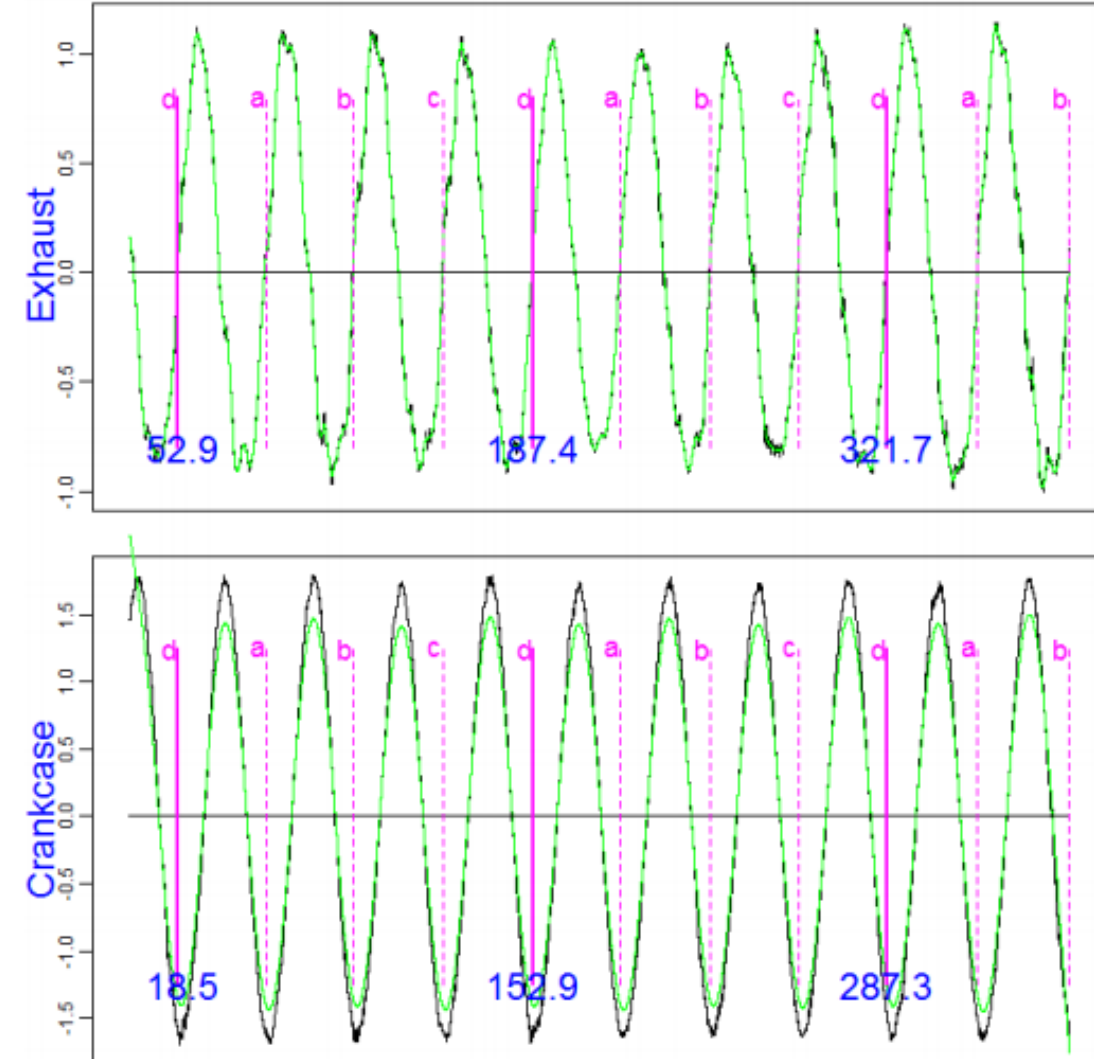
Waveform

There are two waveforms (one green and the other black) for the Exhaust and the Crankcase, each. The black shows the raw data from the piezoelectric sensors. The green waveform is a smoothed version of the raw data, indicating the pressure as typically measures by a less responsive transducer.

The difference between the two represent higher frequency oscillations that contain measures of turbulence and vibrations. (See CS-EP-04b Engine Cycles of the Internal Combustion Engine).

In the exhaust, we do see some slight 'valve overlap' when cylinder a is opening its intake valve while cylinder a has not quite closed completely. We show the valve boundaries at the inflection point of the exhaust curve, as the exhaust flow starts decreasing out of the cylinder.

The crankcase is extremely consistent with the intake valves showing only the slightest variation as the valves open and close.

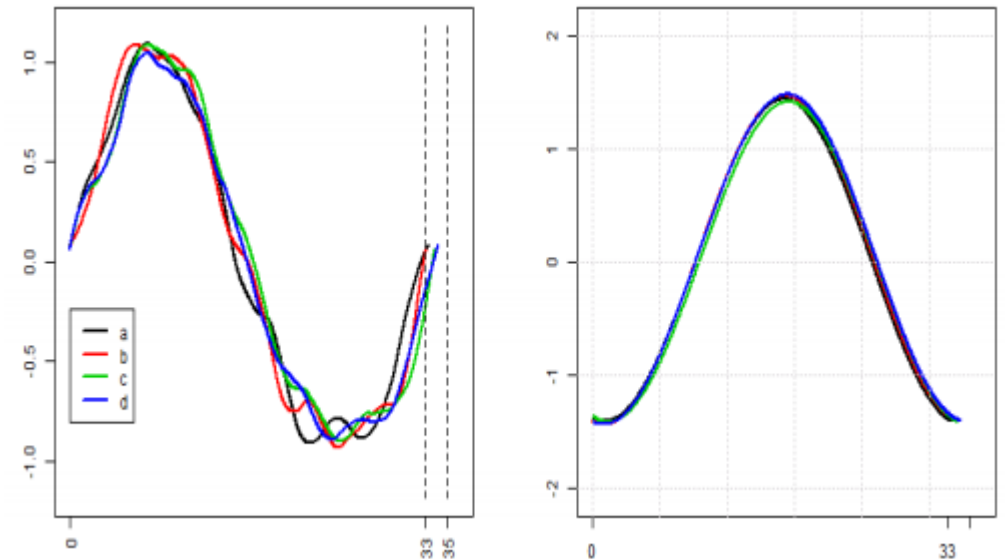


Cylinder Profiles

The cylinder profiles show the pressure in the exhaust and crankcase, respectively, over the duration of time (ms) since the 'boundary' of the opening of the exhaust valve(s).

Both graphs show all cylinders almost superimposing themselves, again illustrating the high consistency of the engine cylinders through its 4-stroke cycle.

Note that the Pressure (smoothed) curves are shown here.



Exhaust and Crankcase pressures (Voltages) by cylinder from start of cylinder boundary in ms.