Pugh Matrix Choices Dialogue

(Why we’re doing what we’re doing and not doing what we’re not doing)

Below is a summary of some of the dialogue that was going on while the Pugh Matrix was being created which aids in the justification of the design choices that were made. This document captures some key points that were made but may not have been clearly reflected through the construction of the matrix.

**What? - Measure Power** – Loaded motor/generator

**Why?** – We feel that if we were to test our engine test stand using a dyno we would be cutting our customer short. A dyno is a test stand. To require a dyno to make our test stand useful would make our product insignificant.

**What? - Measure Temperature** - Thermo coupler

**Why?** – Price. We want to measure temperature in multiple locations and this means we need to be mindful of cost. After the hardware is in place for one thermocouple, the cost of adding more is very small compared to adding multiple ir sensors.


**Why?** - A digital encoder will provide us with a precise angle of the crank shaft from 0 to 360 degrees.

Note: after taking the engine apart it may be easiest to use the magneto that is already built into the engine for the spark timing.

**What? - Direct injection Source** – High pressure water pump.

**Why?** - A pre pressurized vessel would require an accessory compressor tool. The test stand is ideally a standalone test tool.

**What? - Sate of injected H2O** – Preheated

**Why?** - Although it will take more effort to implement this, damage to the engine is much less likely to occur due to less temperature shock.
What? - **Engine Modification** – Eight stroke

Why? - An eight stroke requires less modification. This results in a more reliable engine to run on the test stand.

What? - **Fire Spark Plug** – Leave Stock

Why? - There is no need to adjust this. A system is already in place in the engine that will prove to be sufficient.

What? - **Controls** - Analog circuitry

WHY? – Labview is unable to support the data rates required to run the engine. We can build analog circuitry that is more than capable with supporting the system.

What? – **Observe Record Measurements** – Labview Dashboard w/ DAQ

Why? - We do not have to observe as fast as the timing needs to be controlled. Labview will be sufficient for this. We can also make user friendly dashboards.

What? – **6 Stroke VS. 8 Stroke** – we’re going with the 6 stroke

Why? – Because we could not find valves that could withstand the operating temps to conduct the EGR we decided it would make more sense to be able to control the intake and exhaust valves internal to the engine. We can design circuitry to open and close these valves accordingly based on the timing circuitry.