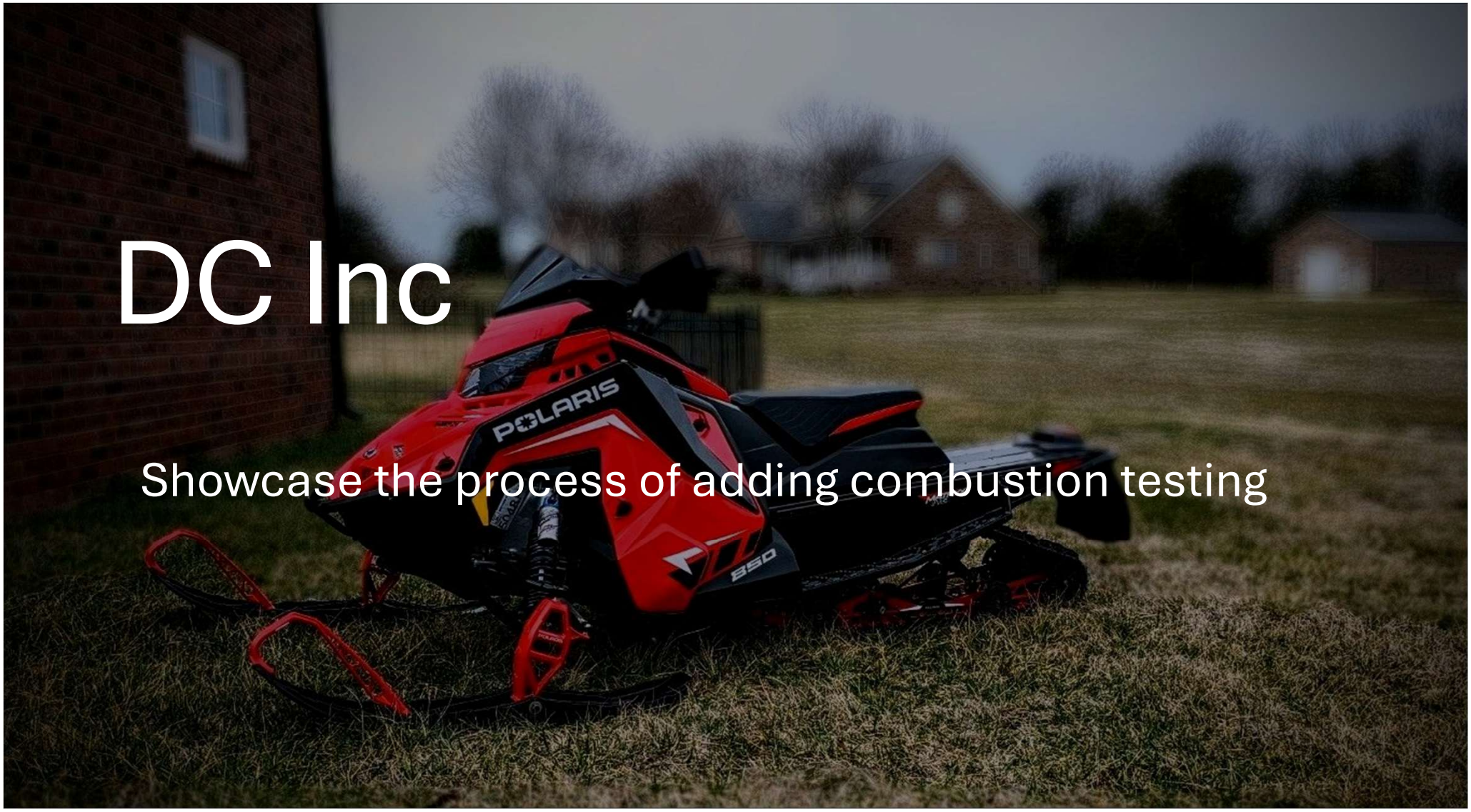


DC Inc

Showcase the process of adding combustion testing

Why data ? .... **Time is money** ....

- **Save Time**
- **Development Direction**
- **Prioritize / Focus**
- **Minimize Waste**
- **Reduce Cost**
- **Increase Durability**
- **Increase Power**
- **Emissions Compliance**

DC Inc Publication Intentions

- Showcase process of adding combustion testing to future customer base
- Showcase test bed for mobility
- Install Plex and DC Inc products in compact / constrained space
- Attract OEM level OPI, powersports and aftermarket industry manufactures
- Test in rigors of snow environment using equipment without compromise to machine functions (packaging / weight)
- Collect 2 stroke data

Test Engine / Sensor Install
850 Polaris Patriot

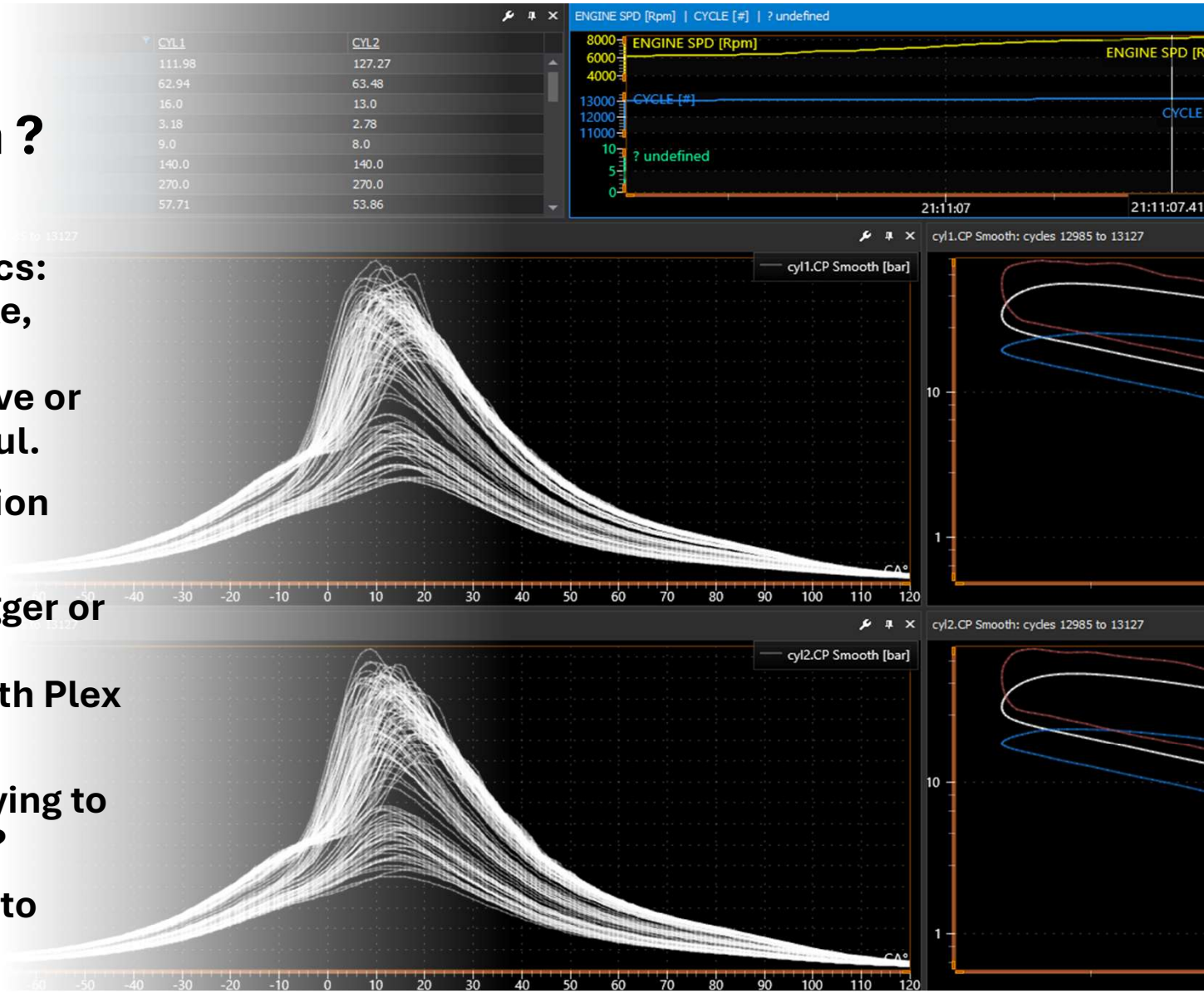
- 2 cylinder / 2 stroke
- 85mm bore x 74mm stroke
- Water cooled
- Fuel injected
- 91 octane fuel
- Widely used in Polaris performance trail and mountain sled market approx. 165 HP
- Same 850 engine platform used with factory turbo charger approx. 185 HP

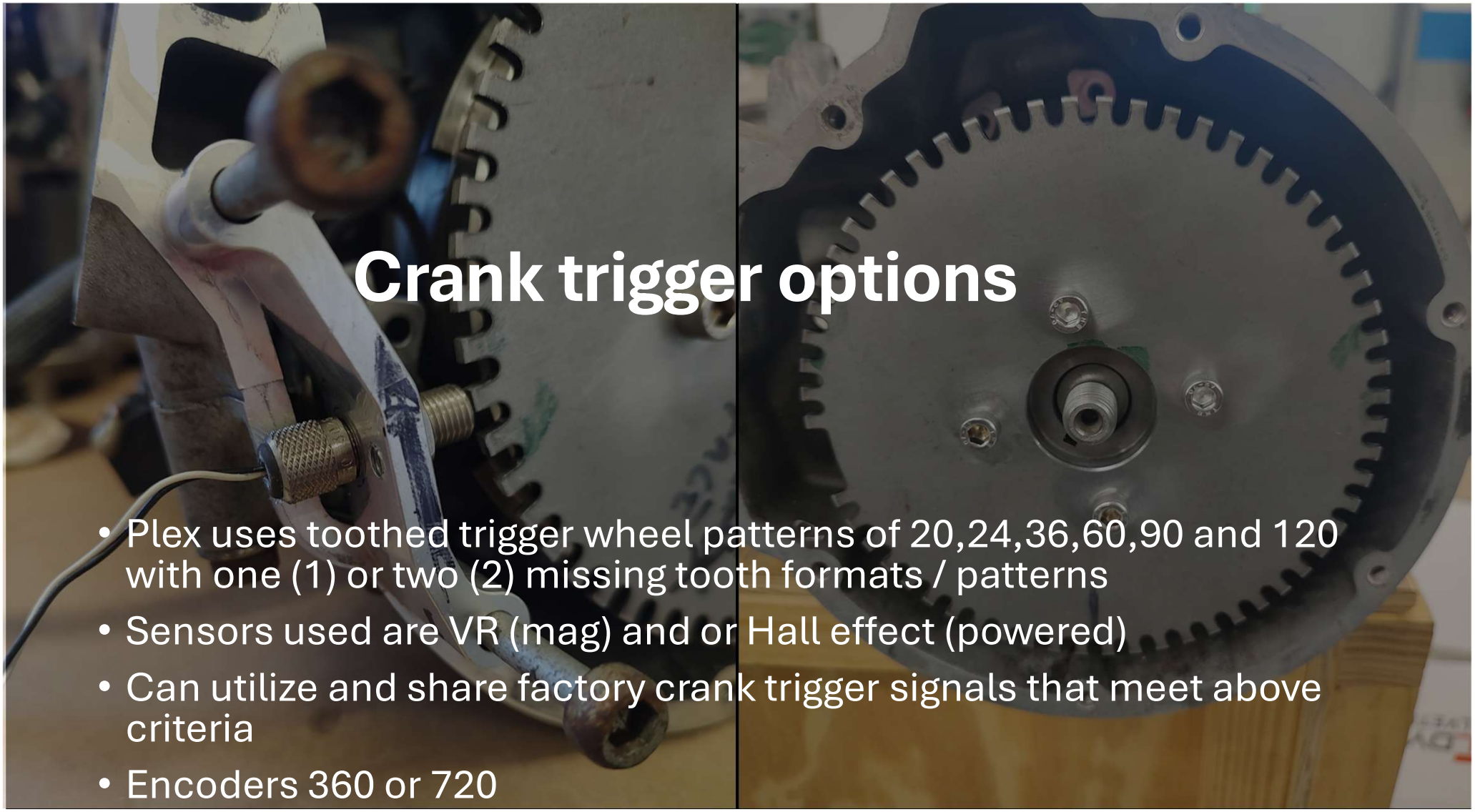
Device mounting in compact spaces for mobility

- PCA 2000 Plus 4x4 inches
- 250 Grams -Light weight and compact enables easy mounting with adhesive products
- Weatherproof / PCA is IP67 sealed
- DC wiring is weatherproof
- Amplifier 2x3 inches 85 grams
- IMU motion and acceleration
- GPS positioning
- Compact battery options available wired for direct connection with DC Inc wiring harnesses
- Access to ethernet cable- used for PC viewing, device configuration and data downloading from device when logged internally during mobility

What is required before we take data ?

- Knowing your engines specs: bore diameter, crank stroke, static compression ratio, connecting rod length, valve or port timing specs are useful.
- Can you install a combustion sensor ?
- Can you install a crank trigger or crank encoder ? (or have a factory trigger common with Plex encoding solution)
- What questions are you trying to answer about your engine?
- What data are you looking to obtain?



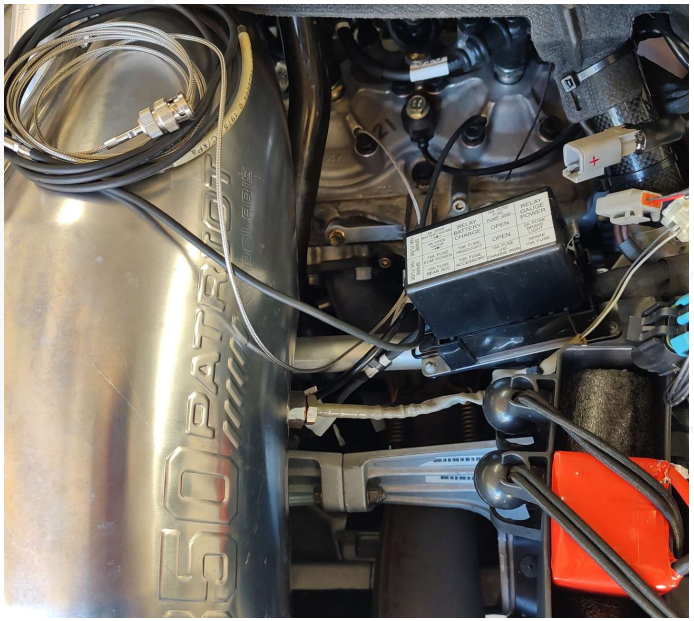


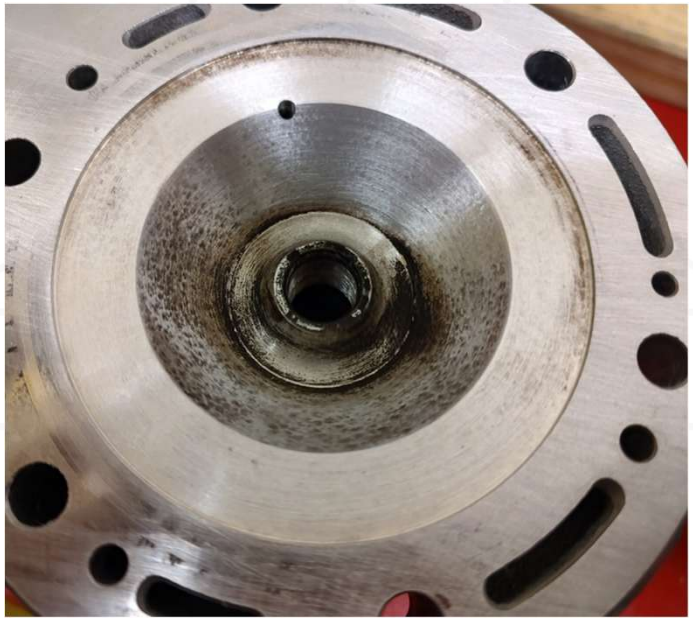
Crank trigger options

- Plex uses toothed trigger wheel patterns of 20,24,36,60,90 and 120 with one (1) or two (2) missing tooth formats / patterns
- Sensors used are VR (mag) and or Hall effect (powered)
- Can utilize and share factory crank trigger signals that meet above criteria
- Encoders 360 or 720

Sensor placement considerations

- Access to sensor installation
- Cable routing clearance for wiring from moving shafts, rotating parts, steering, high temperatures
- Sensor cables can reach amplifier
- Sensor cables avoid high voltage electronics (IE coils)
- Sensor installation avoids water passages
- Sensor installation avoids oil
- Sensor installation tool passes exterior challenges
- Sensor location in combustion space

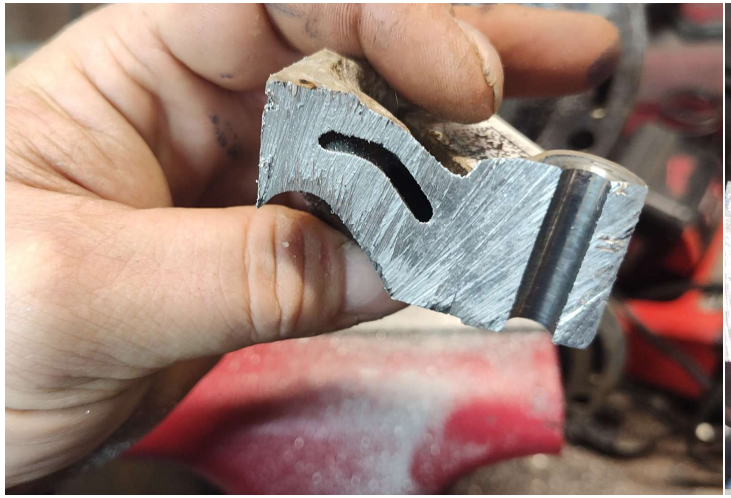


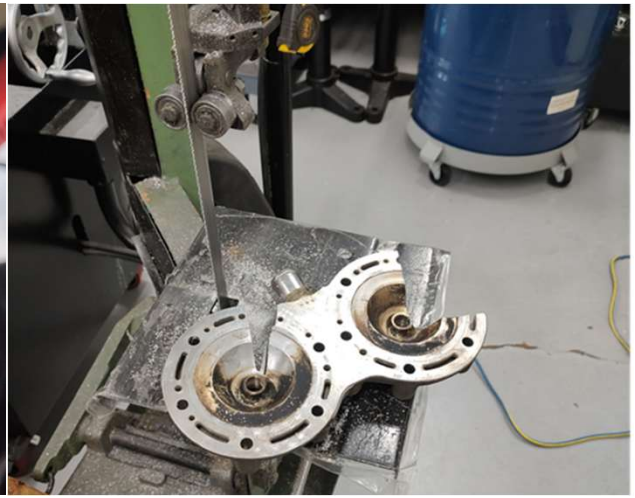


Sensor machining insights

Making a cutaway is a nice tool to ensure sensor machining is properly located.

Using a CAD model and sensor positioning is a great choice whenever possible.



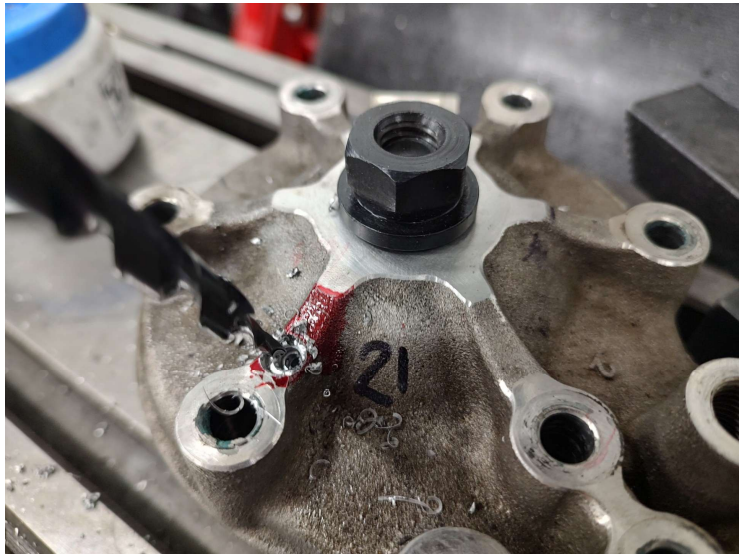


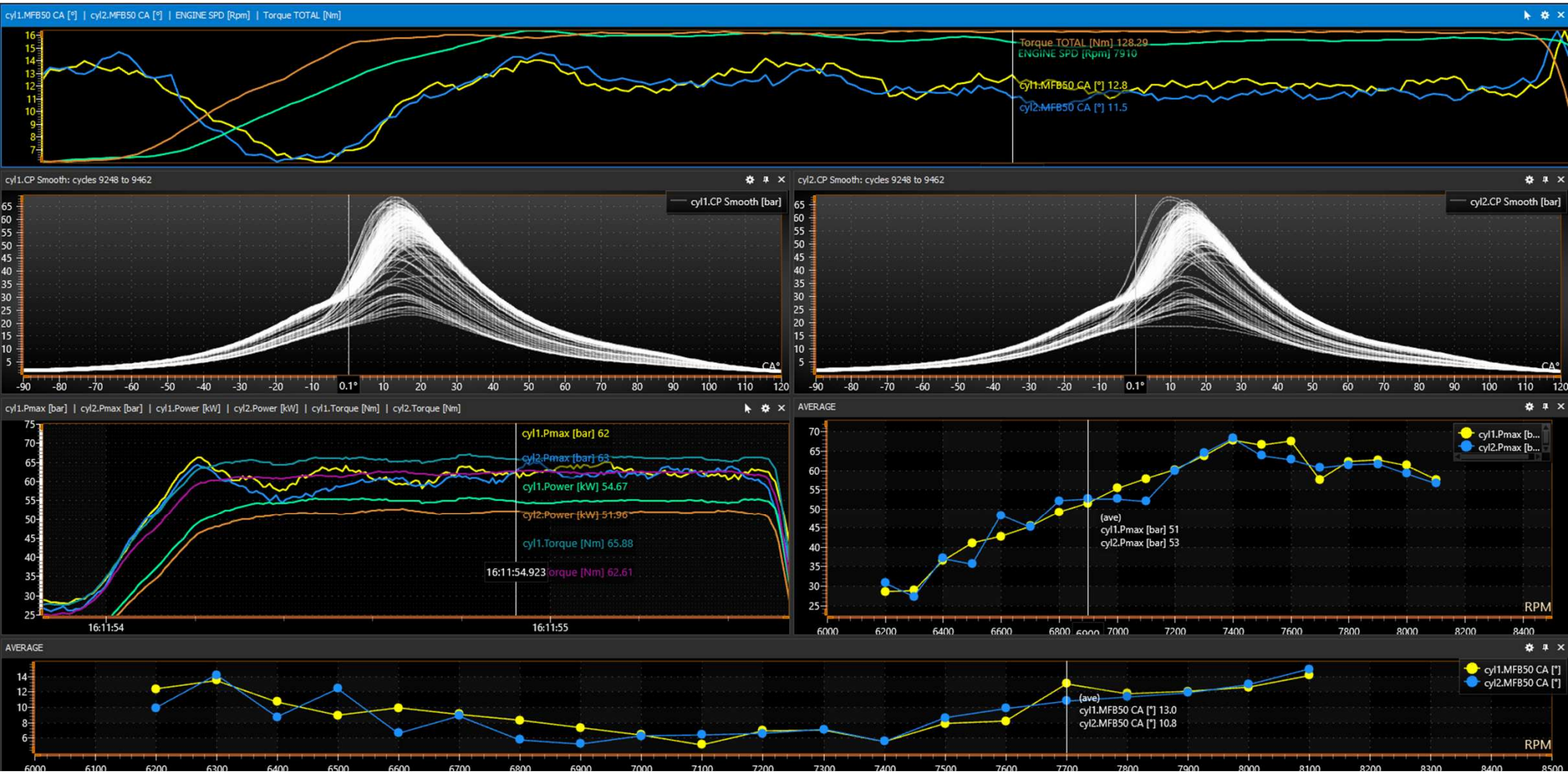
• Determining an angle to machine your sensor in your cutaway

Review of water and oil passages
Casting thicknesses
Areas beyond the casting exterior IE: Head bolts, Exhaust , Chassis constrains
Location and intersection into combustion space (50/50 bisection of quench and combustion space)
Depth of sensor vs angles effect on sensor passage .080-.125 is ideal

Machining for sensor

- Setup in mill based on angle required
- Spot face using center cutting endmill flat .312 (5/16)
- Center drill .125 diameter with sturdy center drill
- Form drill to depth (drill is machined for sensor seat face seal)
- Tap M5 x.5
- **All tools are available from DC Inc**

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Torque TOTAL [Nm] 128.29
ENGINE SPD [Rpm] 7910
cyl1.MFB50 CA [°] 12.8
cyl2.MFB50 CA [°] 11.5
cyl1.CP Smooth: cycles 9248 to 9462
cyl1.CP Smooth [bar]
CA°
cyl2.CP Smooth: cycles 9248 to 9462
cyl2.CP Smooth [bar]
CA°
cyl1.Pmax [bar] | cyl2.Pmax [bar] | cyl1.Power [kW] | cyl2.Power [kW] | cyl1.Torque [Nm] | cyl2.Torque [Nm]
cyl1.Pmax [bar] 62
cyl2.Pmax [bar] 63
cyl1.Power [kW] 54.67
cyl2.Power [kW] 51.96
cyl1.Torque [Nm] 65.88
16:11:54.923
orque [Nm] 62.61
16:11:54
16:11:55
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cyl2.Pmax [b...
(ave)
cyl1.Pmax [bar] 51
cyl2.Pmax [bar] 53
RPM
AVERAGE
cyl1.MFB50 CA [°]
cyl2.MFB50 CA [°]
(ave)
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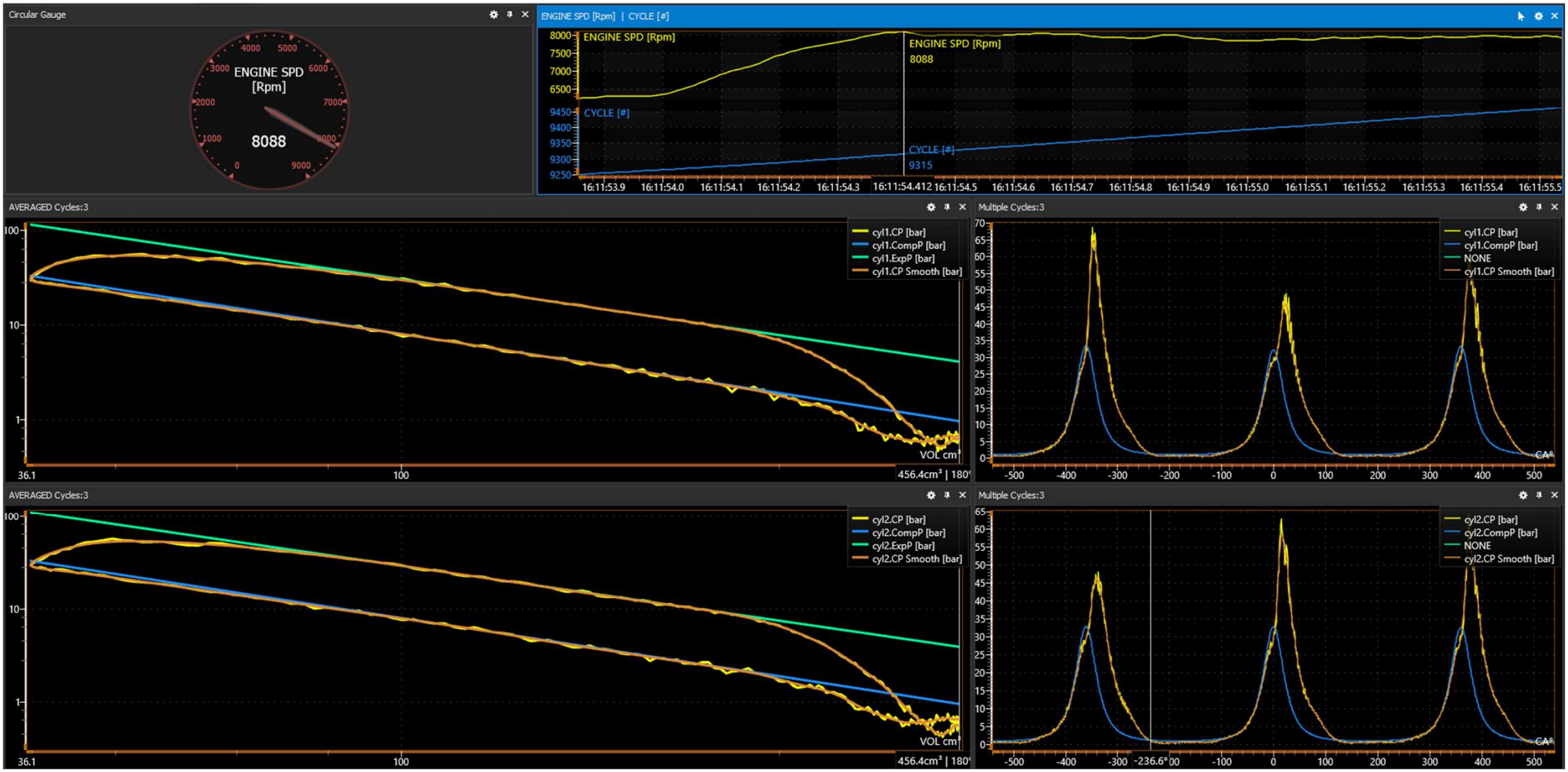
cyl2.MFB50 CA [°] 10.8
RPM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8088
ENGINE SPD [Rpm] | CYCLE [#]
ENGINE SPD [Rpm]
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CYCLE [#]
9315
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cyl1.CompP [bar]
cyl1.ExpP [bar]
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VOL cm³
Multiple Cycles:3
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CA°
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