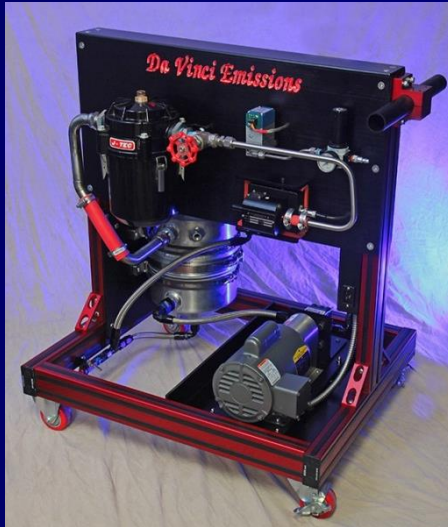


Measurement of Real-Time Lubricant Oil Consumption On Achates Power OP2S Engines Using the Da Vinci DALOC Analyzer



Achates Power Customer Reference

“The Da Vinci DALOC system is a highly capable tool for performing accelerated and real-time engine oil consumption measurements. It enables a full engine mapping in 2 hours. Extensive correlation with volumetric- and gravimetric-based measurements confirmed its repeatability and accuracy. It has been a critical tool to develop the opposed piston engine to achieve oil consumption levels on par with 4-stroke engines.”

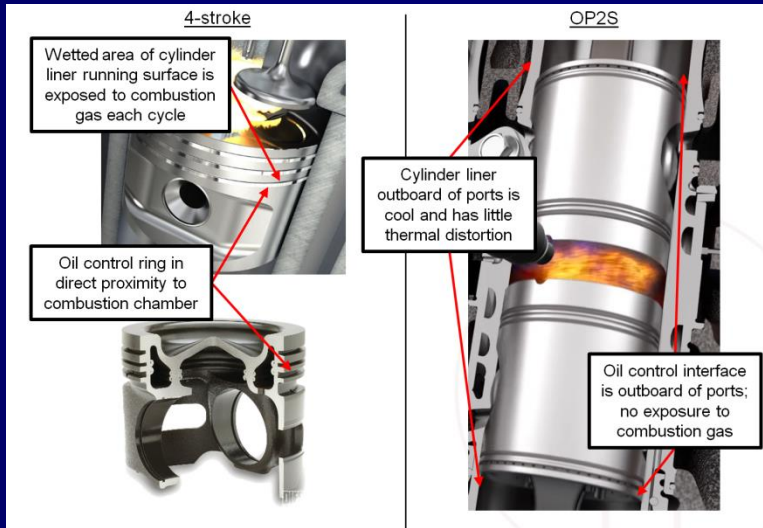
Fabien Redon, CTO

Achates Power
San Diego, California

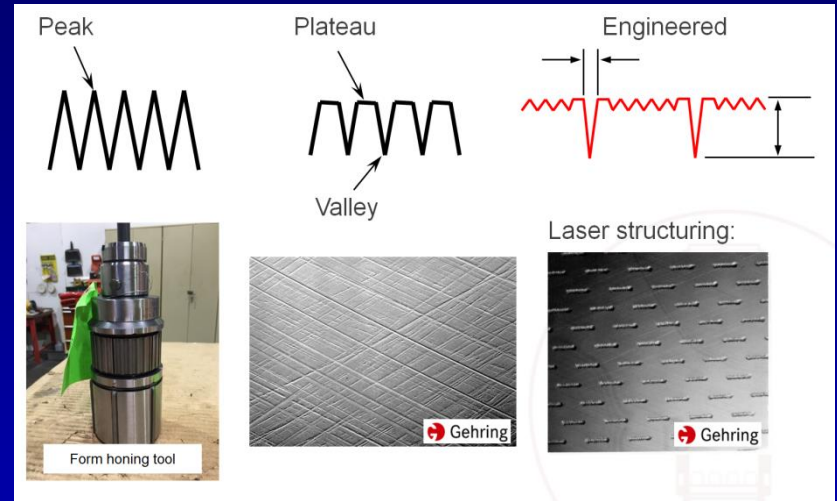


OP2S versus 4S Engine Designs

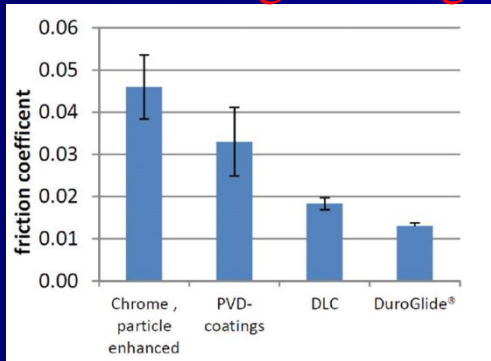
OP2S outboard OCR location



Laser honing



Piston Ring Coating



Piston Rings Designed for OP2S

Top		9254 Fully Inlaid, Keystone GDC Coating Blitz
2 nd		KV4 Rectangular GDC
3 rd		KV4 Rectangular
4 th		KV1 Base Material LKZ CKS Coating Drilled Vent Holes

Tested with various expander tensions

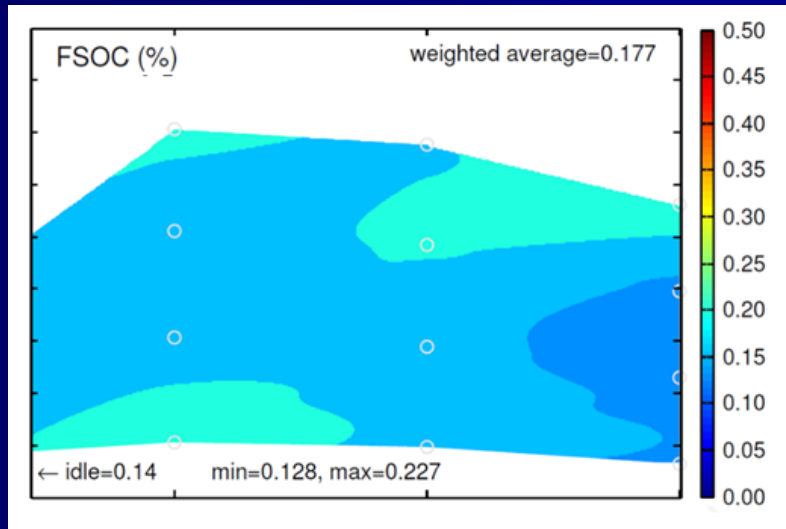
- OP2S PRL Design – OCR location, liner surface texture, coated piston rings designed to reduce scuffing and friction



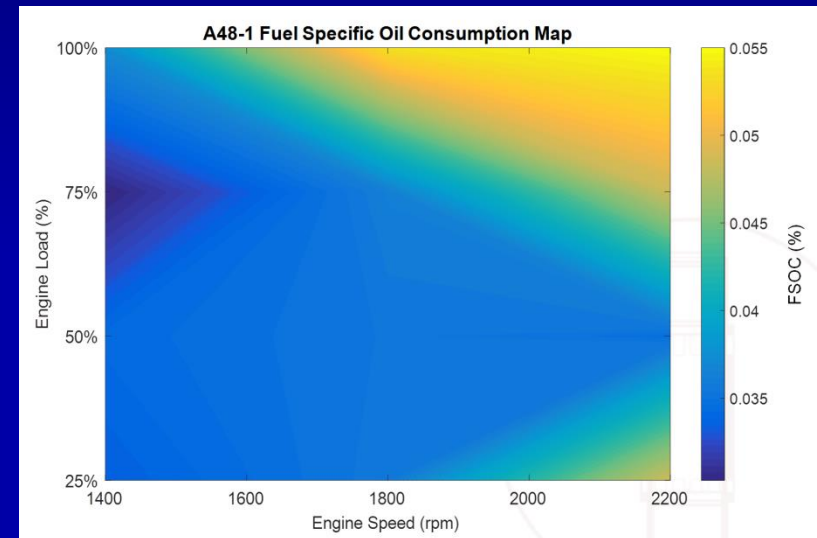
DALOC Data

Achates Power OP2S Engine Prototype MY2011 -> MY 2018

MY 2011 Prototype



MY 2018 A48-1 Prototype



- OP2S 3-4 fold reduction in oil consumption in 7 years of engine development
- Incredible engineering achievement!



Achates Power Conclusions

- OP2S engine architecture has proven to be capable of oil consumption at or below that of modern 4-stroke engines
- Da Vinci DALOC analyzer has proven an excellent tool for verification of engine design development for Achates Power

