

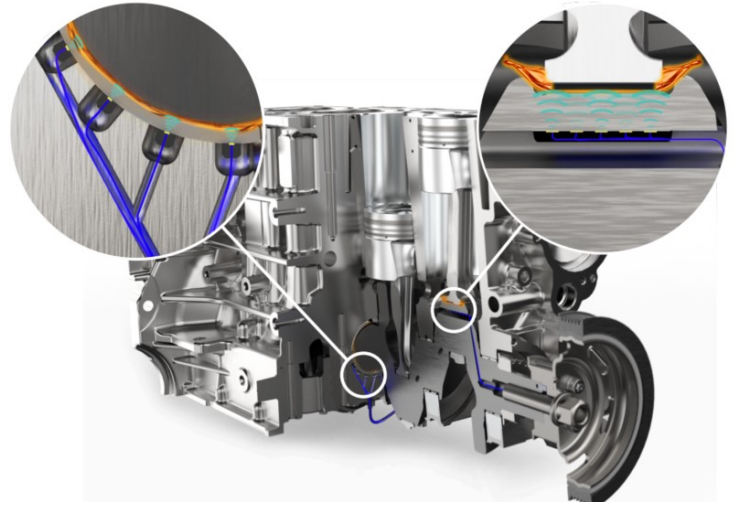
# Embedded engine sensors for main and big end bearing oil film thickness monitoring

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## The Problem

Our collaborator wanted to increase their understanding of the lubricant film thickness in the main and big end journal bearings during a wide range of fired engine operating conditions. Low viscosity lubricants can be used to significantly increase fuel economy and reduce engine emissions, which is required to meet the new EURO 7 emission standards. Lubricants of varying viscosity were trialed to achieve the following:

- Understanding of bearing film thicknesses
- Confirmation it is safe to use low viscosity oils
- Validation of film thickness simulations
- Rapid development of new engines

## Sensor Technologies



Active Ultrasonics



Thermocouples



Position

## Measurements



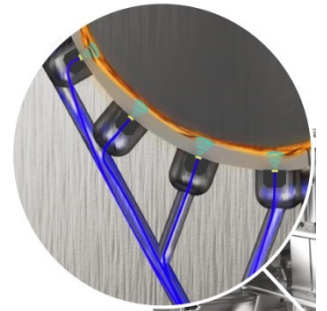
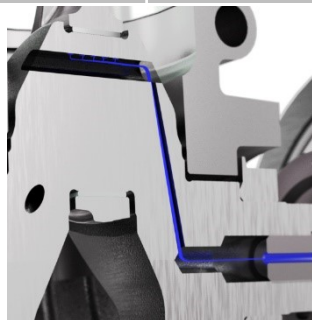
Film Thickness



Stress




Temperature



## Contact Details

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## The Process

Identify what to measure

Instrumentation of machine component in PktoPk labs

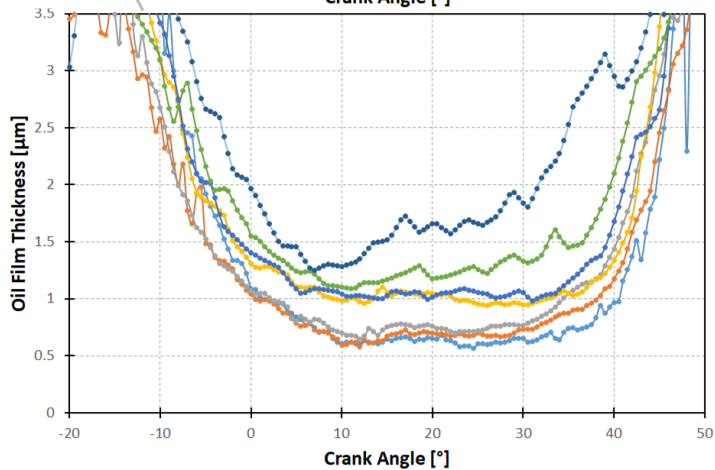
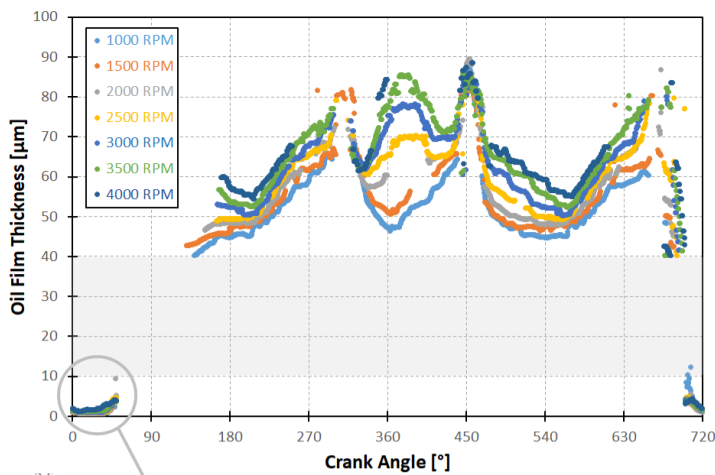
Installation of measurement system on customer site

Data capture during machine operation

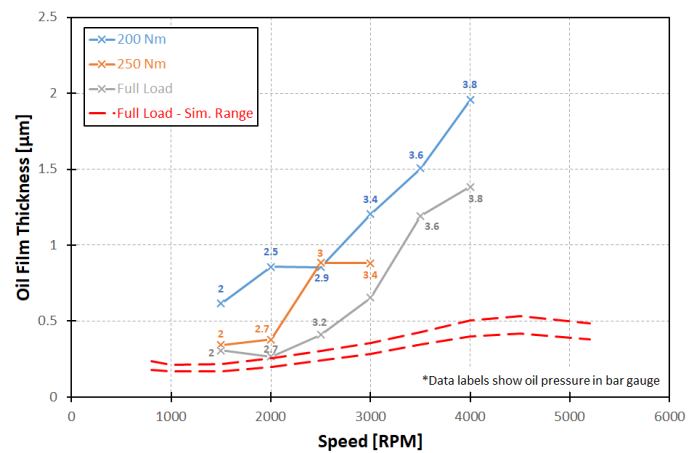
Support in understanding data

## The Solution

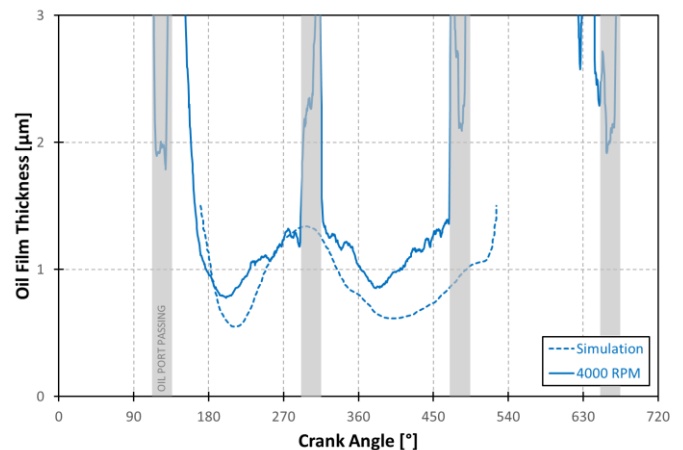
The bespoke sensors outlined above were used to perform a range of measurements during operation. Some example results are given below:



(Top) Example conrod big end bearing film thickness profile, for various speeds across full engine cycle and (bottom) the minimum film region only.



Minimum lubricant film thickness measurements and simulations in conrod big end bearing for OW20 across various loads and speeds.



Measured and simulated film thicknesses for main bearing for OW20 lubricant 4000RPM under full load conditions.

## Additional Resources

MTZ Magazine article - > <https://link.springer.com/content/pdf/10.1007/s38313-021-0732-1.pdf>  
Peer reviewed publication -> Coming soon

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