

Diesel Cylinder Head Design up to 250 Bar Peak Cylinder Pressure

Competitive diesel engine performance demands increased cylinder pressure. The heavy-duty diesel engine industry has recognized the need to produce engines with higher specific output and continually greater efficiency, while meeting increasingly stringent emission standards.

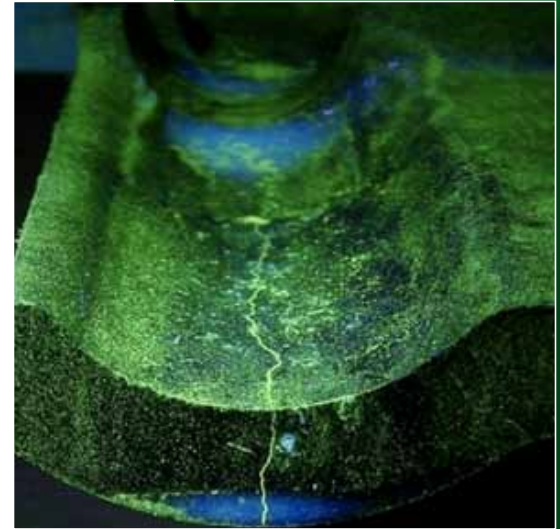
As a major structural component the cylinder head must operate for the life of the engine and is expected to be reused at rebuild. Failure is unacceptable. These expectations preclude durability validation through testing alone, and point to the importance of a well-developed cylinder head analysis methodology.

Southwest Research Institute® (SwRI®) has developed heavy-duty diesel cylinder heads designed for up to 250 bar peak cylinder pressure, using conventional grey iron castings*, and has applied this knowledge and experience to more than 70 different modern engines. SwRI can apply this expertise to assess current cylinder head designs as well as develop heads for new or uprated engines.

Methodology and Applications

SwRI engineers have developed an efficient analysis process and extensive database of cylinder head structural performance that can be applied to:

- Conduct a detailed assessment of existing cylinder head designs and identify design modifications to extend durability, increase peak cylinder pressure capacity, streamline packaging, reduce weight, and improve manufacturability.
- Conduct a complete new cylinder head design and analysis, providing a proven, production-ready design optimized to meet specific engine requirements at up to 250 bar cylinder pressure.



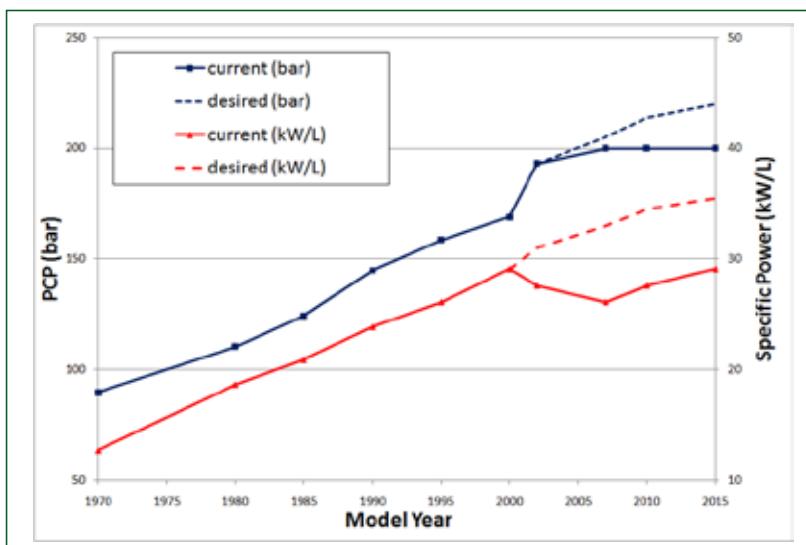
Magnetic particle crack detection

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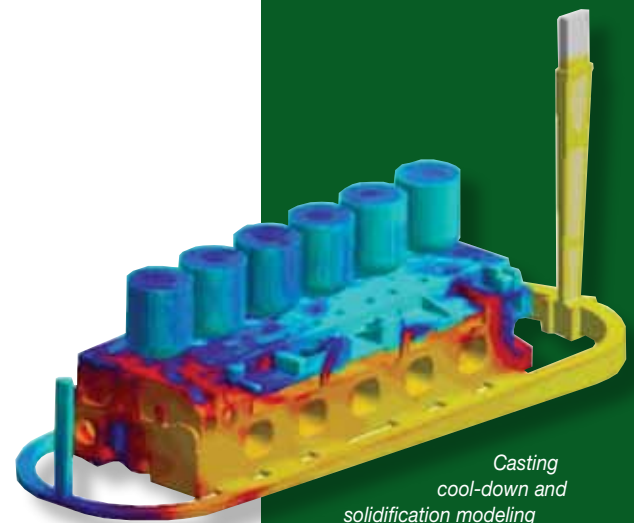
Dimensional accuracy assessment

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Peak cylinder pressure trends in heavy-duty diesel engines

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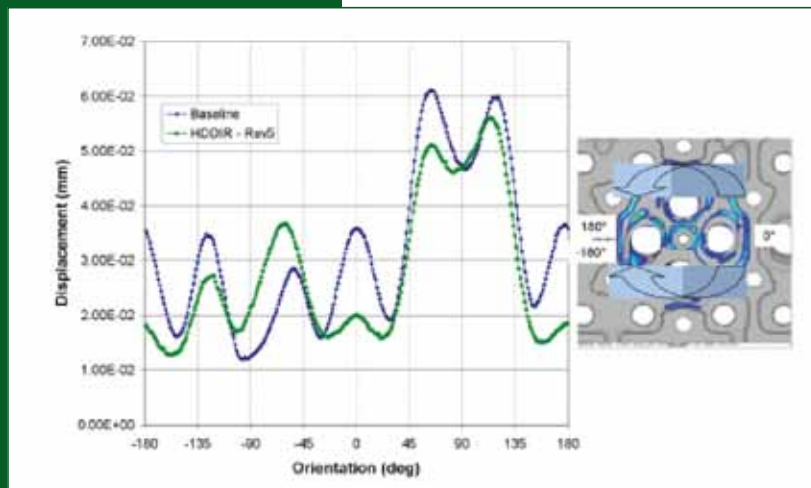
Casting cool-down and solidification modeling

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Capabilities

SwRI has extensive experience in applying a wide range of technologies to diesel engine cylinder head design and optimization. A partial listing includes:

- Finite element analysis (FEA)
- Computational fluid dynamics (CFD) analysis
- Dimensional accuracy assessment
- Probabilistic parameter analysis
- Expertise-based acceptance criteria
- Port flow characterization
- Structural fatigue rig testing
- Patented casting core process
- Casting cooling and solidification modeling
- Combustion seal analysis
- Magnetic particle crack detection
- Machining process load assessment



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Sealing load analysis



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,000 employees who perform contract work for industry and government clients.

We welcome your inquiries.

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