Generation 5 (G5) Cooling System Efficiency

Description of Project
In the ultra-competitive tow-sport boat market, it is critical that engine manufacturers adapt to ever changing market conditions and customer expectations. ILMOR prides itself on producing aspirational and high quality marine engines that incorporate innovative engineering solutions. The focus on continuous improvement ensures elimination of waste and inefficiencies is at the core of the business. Our main customer is MasterCraft – the world renowned and premium marketer of inboard engine tow-sport boats.

Students on this team will redesign two key components of the cooling system of a 6.2L LS-based Gen 5 (L86) V8 engine as marinated by ILMOR Engineering: the heat exchanger and sea water pump. By improving the performance of these two components, ILMOR Engineering hopes to reach a 10% improvement in overall cooling system efficiency. The team is also expected to address other important parameters such as part life, robustness with respect to debris in the sea water, material costs, weight, and manufacturability.

Phase I Deliverables
Deliver a paper-based re-design proposal for the heat exchanger and sea pump. The targets for 10% improvement in overall cooling system efficiency should be fully supported by CAD, CFD and FEA simulations. (This must be completed before the end of Winter term 2017. Major parts will be fabricated externally during summer break)

Phase II Deliverables
Integration and validation testing via dyno or boat testing.

Stretch Goals: HIGH SUCCESS
Achieve a 15% improvement in thermal efficiency of the cooling system
Achieve a 20% sea water pump speed reduction.
Reduce bill of material (BoM) cost of the heat exchanger and sea water pump by 20% collectively
Location
The majority of the work will take place on north campus during the semester(s). Students will periodically visit the ILMOR engineering group in Plymouth, Mi for technical meetings, presentations. ILMOR’s engineering team will support the team’s on-site testing if requested in their Plymouth facility or on a boat in a local lake.

Project Sponsor Mentor
Sponsor: Michael Lindberg

Mike is the Technical Director for ILMOR Engineering in Plymouth with responsibility for all non-IndyCar and marine engine projects. He graduated from Michigan State University with a Bachelor of Science in Electrical Engineering and the University of Michigan Dearborn with a Master’s of Science in Engineering Management. Mike was formerly employed by FCA (17 years) and was the Chief Engineer for the Hellcat and Pentastar engine families. He spends his free time in northern Michigan as an avid boater.

Project Faculty Mentor

Greg Hulbert,
Professor Mechanical Engineering

Professor Hulbert’s research focuses on computational mechanics; finite element methods; structural dynamics; flexible multibody dynamics; dynamic response of composites; vehicle dynamics; engineering mechanics education.

Key Skills & Project Roles

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<tr>
<th>Project Roles</th>
<th>Key Skills and/or Knowledge</th>
<th>Likely Majors</th>
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<tbody>
<tr>
<td>Mechanical Design and Prototyping (2 or 3 students)</td>
<td>Design, development of user requirements, analytical modeling and simulation, fast prototyping, 3D printing, validation</td>
<td>ME, NAME, ISD-Auto, ISD-GAME</td>
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<td></td>
<td>Prerequisite: ME 350 or equivalent completed before WN17</td>
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<tr>
<td>Heat Transfer and Fluids Modeling (2 or 3 students)</td>
<td>Analytic Modeling and simulation, CFD</td>
<td>ME, ChE, AERO, Physics, Math, MICDE</td>
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### Desired Additional Knowledge, Skills and Experience:

Engine and/or marine interest, Mechanical aptitude, CFD, CAD, FEA proficiency, Not prone to sea sickness

### Company Overview

Ilmor began making waves in the marine world in 2002 with engines for the "SuperCat" Racing Series of the American Power Boat Association (APBA). At the same time, we were busy assisting DaimlerChrysler in the development of the V-10 Dodge Viper engine. Our engineers quickly realized the potential to marinize the unique powerplant design of the Viper engine to create high-powered V-10 boat engines. Over the following years, our team of innovative marine engineers made refinements and advancements to deliver even more horsepower and torque from the same lightweight package.

The success of the V-10 engines allowed Ilmor to expand our marine engine line, designing a series of inboard GM-based V-8 engines, each with unique Ilmor developed parts for durability, efficiency and performance.

Today, Ilmor is building a reputation for performance and quality throughout the recreational marine industry. We currently serve as the sole engine supplier for Mastercraft’s full line of inboard tow sport crafts, and with the launch of our revolutionary One Drive/One Touch stern drive solution, we are extending our offerings to include the bow-rider and cruiser markets. Innovative new engine designs continue to take center stage at Ilmor, and continue to showcase our unceasing dedication to excellence in design and engineering, manufacturing and customer service.

### Legal Requirements

#### Citizenship and Right to Work Options

- This project is open to all students regardless of citizenship status

#### Intellectual Property Agreements / Non-Disclosure Agreements (please select)
Students will sign the standard MDP IP/NDA agreement

**Internship Information**

- A summer Internship is available for one or two student participants at ILMOR. All students who join the Ilmor team are guaranteed an interview.