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Development of Mechanical Injector 1D AMESIM Simulation model for Ship

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The rapid development of technology in the maritime transportation sector has led to an increasing need for highly fuel-efficient and low-emission systems. In this context, injectors play a crucial role in improving fuel efficiency and reducing emissions. For maritime transportation, such as marine vessels, one of the injectors that can be used is the mechanical injector. Mechanical injection systems use mechanical pumps to deliver fuel directly into the combustion chamber, where it mixes and combusts with air. Mechanical injection diesel engines rely on a mechanical pump to inject fuel directly into the combustion chamber through individual injector nozzles. The process of developing a mechanical injector involves several stages that require significant time and cost. To reduce both the development time and costs, we propose a 1D mechanical injector simulation model, developed using AMESIM software. This model allows for the simulation of the performance of the mechanical injector being developed. It can also simulate the most effective injection strategies for a mechanical injector. The model consists of three main components: the mechanical injector, the delivery valve, and the inline injection pump. By using this model, we can simulate the injection process by adjusting the parameters of the AMESIM component and input conditions to trigger the injection. In this study, we simulate two types of fuel: diesel and Castrol oil, under two pressure conditions, P = 0.25 MPa and P = 190 MPa. The model is capable of demonstrating three key parameters: needle lift, injection flow rate, and injection volume. The model works effectively, allowing us to modify dimensions or strategies to achieve the most efficient mechanical injection performance.

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