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**Review: Prime Movers of Globalization: The History and Impact of Diesel Engines and Gas Turbines**

By Vaclav Smil

Reviewed by Byron Anderson

DeKalb, Illinois, USA

Smil, Vaclav. *Prime Movers of Globalization: The History and Impact of Diesel Engines and Gas Turbines*. Cambridge, MA: The MIT Press, 2010. 261 pp. ISBN: 9780262014434, US \$29.95, cloth.

*Prime Movers of Globalization* is about the history and impact of the internal combustion engine invented by Rudolf Diesel in the 1890s and the gas turbine invented by Frank Whittle and Hans-Joachim Pabst von Ohain in the 1930s. Diesel's engines evolved to power ships, railroads, trucks and generators, and gas turbines evolved to power jet airplanes. Gas turbines and diesel engines eventually became indispensable technologies to worldwide trade and transportation, yet are commonly overlooked as movers of the global economy. The book will help correct this gap.

Smil, Distinguished Professor at the University of Manitoba and author of many books on energy, ecology and globalization, describes development of the engines, including the inventions that led to the diesel and turbine engines and the subsequent alterations, advancements and transformations made to the engines. These would include key inventors, for example, the gas-fueled engines of Nicolaus Otto, Gottlieb Daimler, and Karl Benz, and companies that furthered turbine technology through research, such as General Electric, Rolls Royce, and Pratt and Whitney. Clearly, Smil admires what it took to develop these massive engines, though the associated problems are also mentioned, for example, job losses incurred by the move of manufacturing plants to overseas locations made possible by large bulk carriers.

While categorized as a book of history and globalization, environmental issues are included, for example, greenhouse gas-emissions from ships, trucks and aircraft, and the global spread of microbes and invertebrate species in ballast waste of commercial ships. Surprisingly, diesel engines and gas turbines are the most efficient machines ever for moving bulk cargo long-distances, and "maritime shipments have the lowest carbon dioxide emission rates when compared to other modes of cargo traffic in terms of per tons kilometer..." (p. 162). No practical replacements will challenge these movers anytime soon, and Smil believes that in the long run, there will always be more globalization, not less. The ecological footprint of diesel engines and gas turbines has been continuously improved by technology, and new devices and procedures under development should provide further efficiencies. Interestingly, prime movers have probably reached their maximum size, and making ships or jets larger or faster than what exist today will cause them lose their efficiency and economy of scale.

This book is not casual reading. The level of technical detail may challenge some, though most interested readers should come away with a deeper appreciation of the history and technology. The text is nicely supplemented graphs, charts, maps and pictures. The book concludes with a useful glossary of measurement units, references, and name and subject indices. Recommended for academic libraries.

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