Mechanical Prime Movers

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Foreword

The mechanical prime movers discussed in this book are mainly those which convert the heat energy in conventional fossil fuels into useful sources of mechanical power. The conversion process takes place within the engine system (unlike the steam engine or steam turbine) using atmospheric air both as the working fluid and the source of oxygen for combustion. An exception is the closed cycle gas turbine (mentioned in chapter 8) for which an external heat source may be provided by conventional or nuclear fuels.

The spark-ignition engine is probably the best known because of its very wide use in cars and other road vehicles. However, chapter 1 discusses the types of s.i. engine that are used for industrial applications other than road transport. Large road transport vehicles and mobile off-highway equipment are increasingly important to industry; though the diesel engine (chapter 5) is the principal prime mover in this field, the gas turbine has considerable potential (chapter 9).

Diesel engines are manufactured in a wide range of sizes, and are discussed here in two groups: from the smallest units to about 400 kW (chapter 2) and the medium-large range (chapter 3). Although there is now no marked difference in basic design of diesels for industrial or marine use, there are particular characteristics that must be considered in the marine field (chapter 4).

From many years of experience and development, the reciprocating piston engine is still the most widely used, and most economical to build and operate for a mass market; however, rotary engines have specific advantages, and their use will increase. Derivatives of the aircraft gas turbine engine are used as large land and marine power units (chapter 7), while other gas turbines have been designed specifically for industrial applications (chapter 8). A relative newcomer is the rotary piston machine; the Wankel engine is currently being widely developed in spark- and compression-ignition forms (chapter 6).

The efficient use of prime movers depends on various ancillary systems: fuel supply, ignition systems, induction and exhaust (chapters 10, 11, 12), and on correct lubrication and maintenance (chapters 14, 15). Efficiency and economy may be considerably affected by variations in operating parameters; some basic control functions and systems are discussed in chapter 13.

Engine designers and builders have to keep up with developments in design, materials, and techniques, in order to compete; a list of some makers of different types of engine is appended as a source of further information.

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