



2017

Mechanical Drive Order Survey

Diesel & Gas Turbine
WORLDWIDE

engine systems technology for marine,
stationary power, oil & gas and rail since 1969

Quiet Drives

The 12th Annual Mechanical Drive Order Survey

BY JACK BURKE

Each year, our online magazine, *Diesel & Gas Turbine Worldwide* (www.diesलगasturbine.com) conducts three surveys designed to provide details on the markets of larger reciprocating engines, steam turbines and gas turbines used in power generation, marine propulsion and mechanical drive applications.

Data is divided into three reports in order to provide a more in-depth look at each market segment. The Mechanical Drive Order Survey is devoted to engine orders for mechanical drive applications including pumps, compressors, oil exploration machinery, rail and other industrial applications. The Power Generation Order Survey examines reciprocating engines, steam turbines and gas turbines for power generation service. The Marine Propulsion Order Survey examines mechanical drive, auxiliary and diesel-electric marine propulsions systems.

Procedures

The Mechanical Drive Order Survey includes prime movers beginning at 670 hp (500 kW or 0.5 MW). New orders are broken into reciprocating engine, gas turbine and steam turbine orders.

Fuel types are simplified to reflect only liquid versus gaseous fuels. Liquid fuel, as reported in this survey, can be any form of diesel oil.

It is important to note that the data in this survey does not represent units shipped, but only the total orders received during the 2016 calendar year.

An accompanying table shows the geographic breakdown we provide original equipment manufacturers (OEMs), highlighting the specific countries within the reported geographic regions.

Every effort is made to ensure that this survey is as complete and comprehensive as possible. The surveys would not have the level of detail they contain without the generous

MECHANICAL DRIVE RECIPROCATING ENGINE ORDERS, January – December 2016

| Output Range (MW) | Number Of Units | Total Engine Output For Each Output Range (MW) | Engine Operating Speed Ranges | | | Fuel | | | Western Europe | Eastern Europe, Russia & CIS | Middle East | Far East | Southeast Asia & Australia | Central Asia | North Africa | Central, West, East & South Africa | North America | Central America & Caribbean | South America |
|-------------------|-----------------|--|-------------------------------|-----------------|----------------|-------------|------------|-------------|----------------|------------------------------|-------------|------------|----------------------------|--------------|--------------|------------------------------------|---------------|-----------------------------|---------------|
| | | | 300 to 600 rpm | 720 to 1000 rpm | above 1000 rpm | Diesel Fuel | Heavy Fuel | Natural Gas | | | | | | | | | | | |
| 0.50 to 1.00 | 1942 | 1176 | 0 | 0 | 1942 | 1879 | 13 | 50 | 767 | 20 | 2 | 104 | 105 | 26 | 10 | 17 | 885 | 0 | 6 |
| 1.01 to 2.00 | 576 | 880 | 0 | 28 | 548 | 489 | 0 | 87 | 261 | 11 | 25 | 21 | 39 | 18 | 12 | 3 | 152 | 2 | 32 |
| 2.01 to 3.50 | 97 | 230 | 0 | 23 | 74 | 79 | 0 | 18 | 7 | 2 | 0 | 40 | 0 | 6 | 0 | 5 | 37 | 0 | 0 |
| 3.51 to 5.00 | 5 | 18 | 0 | 5 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| 5.01 to 7.50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7.51 and above | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 2620 | 2304 | 0 | 56 | 2564 | 2447 | 13 | 160 | 1035 | 33 | 27 | 165 | 144 | 50 | 27 | 25 | 1074 | 2 | 38 |

MECHANICAL DRIVE GAS TURBINE ORDERS, January – December 2016

| Output Range (MW) | Number Of Units | Total Engine Output For Each Output Range (MW) | Fuel | | | Western Europe | Eastern Europe, Russia & CIS | Middle East | Far East | Southeast Asia & Australia | Central Asia | North Africa | Central, West, East & South Africa | North America | Central America & Caribbean | South America |
|-------------------|-----------------|--|-------------|------------|-------------|----------------|------------------------------|-------------|----------|----------------------------|--------------|--------------|------------------------------------|---------------|-----------------------------|---------------|
| | | | Diesel Fuel | Heavy Fuel | Natural Gas | | | | | | | | | | | |
| 1.00 to 2.00 | 2 | 3.2 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.01 to 3.50 | 1 | 3.5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 3.51 to 5.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5.01 to 7.50 | 4 | 23 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7.51 to 10.00 | 3 | 25 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10.01 to 15.00 | 10 | 134 | 0 | 0 | 10 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| 15.01 to 20.00 | 16 | 246 | 0 | 0 | 16 | 3 | 9 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 |
| 20.01 to 30.00 | 16 | 397 | 0 | 0 | 16 | 0 | 2 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30.01 to 60.00 | 26 | 853 | 0 | 0 | 26 | 0 | 0 | 4 | 0 | 0 | 0 | 18 | 0 | 1 | 3 | 0 |
| 60.01 to 120.00 | 2 | 172 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120.01 to 180.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180.01 and above | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 80 | 1856.7 | 2 | 0 | 78 | 3 | 14 | 29 | 2 | 2 | 0 | 18 | 2 | 7 | 3 | 0 |

MECHANICAL DRIVE STEAM TURBINE ORDERS, January – December 2016

| Output Range (MW) | Number Of Units | Total Engine Output (MW) | Steam Turbine Types | | | | | Western Europe | Eastern Europe, Russia & CIS | Middle East | Far East | Southeast Asia & Australia | Central Asia | North Africa | Central, West, East & South Africa | North America | Central America & Caribbean | South America |
|-------------------|-----------------|--------------------------|---------------------|----------------|-----------|------------|-----------|----------------|------------------------------|-------------|-----------|----------------------------|--------------|--------------|------------------------------------|---------------|-----------------------------|---------------|
| | | | Condensing | Non-Condensing | Reheat | Extraction | Induction | | | | | | | | | | | |
| 0.0 to 1.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1.01 to 5.00 | 5 | 16.3 | 0 | 0 | 5 | 1 | 4 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | |
| 5.01 to 10.00 | 16 | 113.6 | 6 | 2 | 5 | 5 | 3 | 0 | 3 | 6 | 0 | 3 | 0 | 0 | 4 | 0 | 0 | |
| 10.01 to 30.00 | 18 | 343.5 | 4 | 0 | 10 | 11 | 3 | 0 | 3 | 1 | 4 | 1 | 0 | 3 | 6 | 1 | 0 | |
| 30.01 to 60.00 | 11 | 424.2 | 4 | 0 | 3 | 6 | 1 | 0 | 3 | 2 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | |
| 60.01 to 120.00 | 1 | 90 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 120.01 and above | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Totals | 51 | 987.60 | 14 | 2 | 23 | 24 | 11 | 0 | 9 | 9 | 11 | 0 | 7 | 0 | 4 | 10 | 2 | 0 |

contributions of the participating companies. It is important to note that while every attempt is made to include as many manufacturers as possible, the lineup of participants can and does vary from year to year. The survey, therefore, is a snapshot of the global market in 2016. An accompanying table identifies those companies that participated in the 2017 survey.

It is also important to note some units reported in the

2017 Mechanical Drive Order Survey did not have complete information. In some cases OEMs chose not to provide engine output, fuel type or geography for some of their reported orders.

Overview

This marks the 12th year for the Mechanical Drive Order Survey. Year-over-year comparison shows a decline

continued on page 4

Mechanical Drive Order Survey Contributors

Gas Turbine Manufacturers

- GE Oil & Gas
- GE Power
- MAN Diesel
- Mitsubishi Hitachi Power Systems
- JSC Ural Turbine Works
- Zorya-Mashproekt
- Siemens
- Yanmar
- Vericor

Steam Turbine Manufacturers

- GE Oil & Gas
- GE Power
- MAN
- Mitsubishi Heavy Industries Compressor Corp.
- Mitsubishi Hitachi Power Systems
- Fincantieri

Reciprocating Engine Manufacturers

- Caterpillar Inc.
- GE Power
- Rolls-Royce

in total orders (all reported drivers types) from 2015 to 2016. This year's survey catalogued 2791 orders (2016 data), an 18% decline compared to last year's report (2015 data), which recorded 3371 units.

The accompanying graphs show the cyclical nature facing the mechanical drive applications reporting into this survey.

Some of the same challenges from the past few years — oil prices below US\$50 a barrel, economic uncertainty and political unrest in major oil and gas producing countries — seemed to be a continued headwind for the industry in 2016.

Reciprocating Engines

The number of reciprocating engines ordered in 2016 total 2620 units, an 18% drop compared to last year's survey result of 3205. The majority of orders were divided between the output ranges of 0.50 to 1 MW (1176 units) and 1.01 to 2.00 MW (880 units).

Engine operating speeds above 1000 rpm accounted for 98% of the recip orders reported in the survey.

Diesel fuel once again dominated the fuel type, accounting for 93% of the reported orders.

North America claimed the top geographic destination for reciprocating engines in 2016 (41%). North America's shale development and infrastructure remains unrivaled, keeping it the top geographic destination for mechanical drive reciprocating engines for the foreseeable future.

Western Europe was the second top geographic destination for recip engines within the mechanical drive segment receiving 39% of the orders in 2016, followed by the Far East, which received 6%.

Gas Turbines

Gas turbine orders decreased 8% compared to the 2016 Mechanical Drive Order Survey. Total orders reported in this survey equaled 80.

Units with the output range of 30.01 to 60.00 MW received the most orders (33%), followed by units rated 15.01 to 20.00 (20%) and 20.01 to 30.00 MW (20%).

The Middle East was the top geographic location for gas turbines in mechanical drive applications, receiving 36% of the orders. North America claimed the number two geographic location, accounting for 23% of the orders reported, followed by Eastern Europe, Russia and CIS (18%).

Steam Turbines

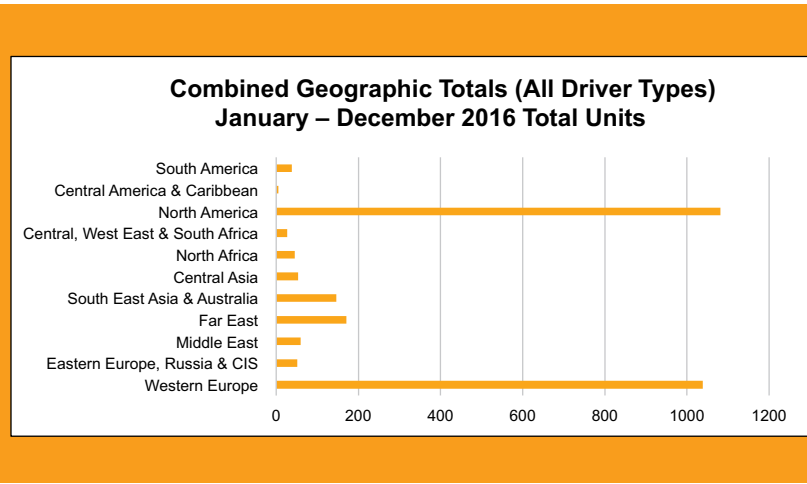
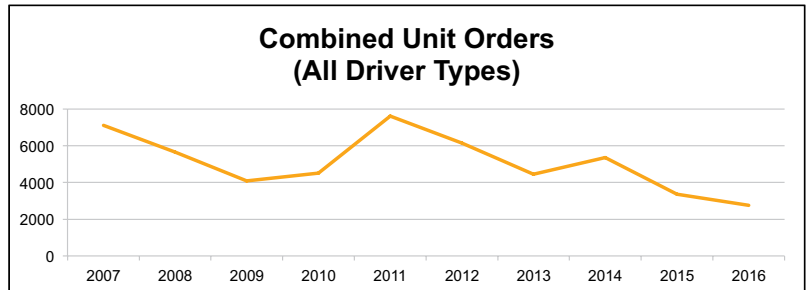
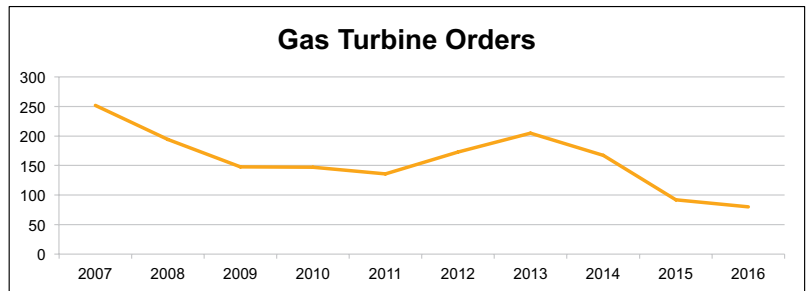
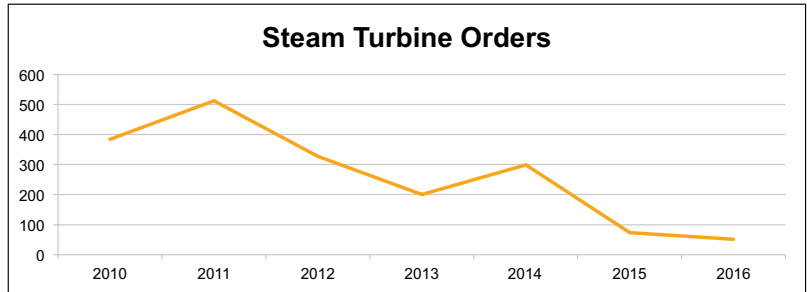
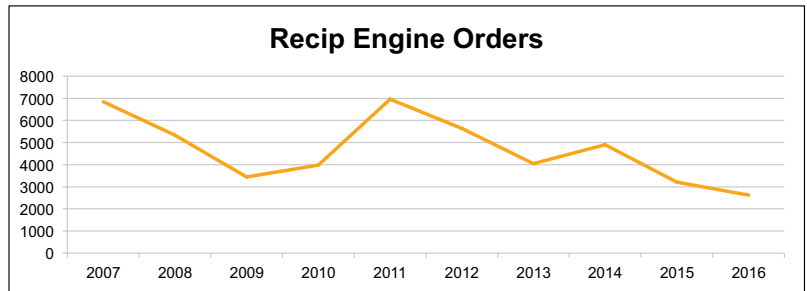
Steam turbine orders dropped 31% compared to last year's surveys. Total steam turbine units ordered in 2016 was 51, falling mostly within the 10.01 to 30.0 MW output range (43%).

Extraction steam turbines saw the most demand, accounting for 47% of the total steam turbines ordered.

The Far East claimed the top geographic location with 22% of the total units ordered. North America accounted for 19.6%, followed by the Middle East and Eastern Europe, Russia and CIS, which each had 18%.

Annual Surveys

On behalf of *Diesel & Gas Turbine Worldwide* and *COMPRESSORtech²*, thank you to all contributors for your continued participation in this annual survey process. It is our hope that the surveys combined will provide an accurate snapshot of the entire large engine landscape, with fine-tuned detail provided for three market segments through each individual report — power generation, mechanical drive and marine propulsion. Electronic versions of past surveys are available on the *Diesel & Gas Turbine Worldwide* website, www.diesलगasturbine.com. **CT2**





Diesel & Gas Turbine **WORLDWIDE**

engine systems technology for marine,
stationary power, oil & gas and rail since 1969



www.diesलगasturbine.com