Strength Seen in Marine Orders

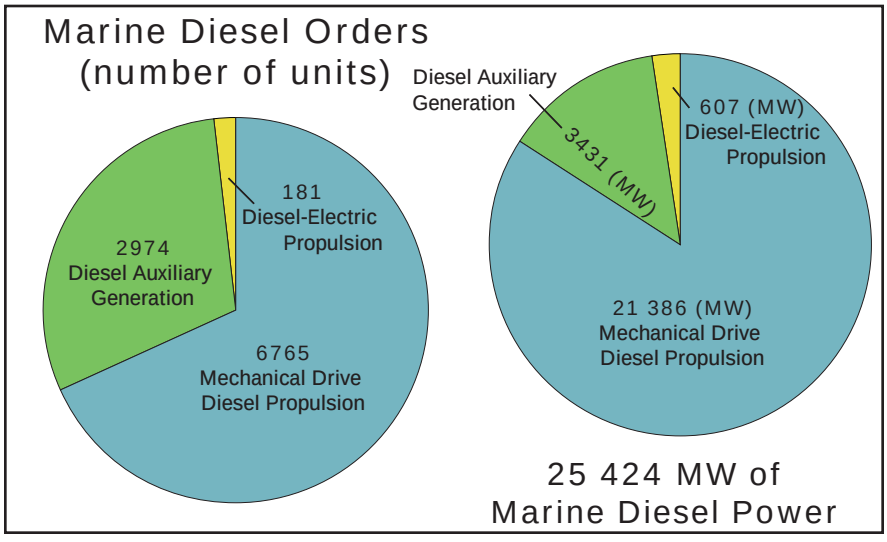
Mechanical and auxiliary orders up nicely, while diesel-electric continues to lag

by Mark McNeely

This year marks our 6th annual survey of mechanical drive marine propulsion engine orders. Diesel engine orders in this year's survey have improved significantly over last year, nearly reaching the levels attained in the 2001 survey period. Mechanical drive orders have risen to 21 386 MW in 2003 from 14 437 MW in 2002. Investments in new tankers and bulk carriers has helped buoy these numbers, as well as a dramatic increase in building of smaller vessels — particularly for security/patrol purposes. Diesel auxiliary generating unit orders are also correspondingly up over last year, meanwhile, the diesel-electric marine propulsion orders continue to slide.

As *D&GTW* has conducted in the past, this year's surveys also include the 12th consecutive year in reporting orders for marine auxiliary generation engines, as well as the 7th year in recording orders for diesel-electric marine propulsion units.

We continue to solicit the engine builders for marine gas turbine orders, however, gas turbines remain a small portion of overall propulsion engine orders. Thus, gas turbines are included in the mechanical drive engine order



MECHANICAL DRIVE DIESEL MARINE PROPULSION ORDERS, June 2002 – May 2003

Output Range (MW)	Number of Engines	Total Output (MW)	Engine Speed (r/min)				Fuel (Units)		Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australasia	Central Asia	North Africa	Central, W., E. & S. Africa	North America	Central America	South America
			Below 300	300-600	720-1000	Above 1000	Diesel Oil	Heavy Fuel											
0.5-1.0	3175	2011		5	107	3063	3156	19	967	19	115	587	648	66	33	4	674	20	42
1.01-2.0	2214	2932	5	18	367	1824	2169	45	908	59	40	272	230	46	2		624	16	17
2.01-3.5	327	822	14	27	99	187	272	55	102	12	38	72	56	8		6	31		2
3.51-5.0	141	580	34	37	32	38	70	71	63		5	59	12		1		1		
5.01-7.5	161	1046	61	57	16	27	38	123	58	1	2	84	11				5		
7.51-15.0	468	4764	391	77			12	456	53	21		381	9				4		
15.01-30.0	147	2813	133		14		14	133	17	11		102			1		16		
30.01-50.0	80	3242	80					80	4			76							
50.01 + above	52	3176	52					52	3			49							
Totals	6765	21 386	770	221	635	5139	5731	1034	2175	123	200	1682	966	120	37	10	1355	36	61

*Geographic location is at the shipbuilding site

MECHANICAL DRIVE DIESEL MARINE PROPULSION ORDERS, June 2001 – May 2002

Output Range (MW)	Number of Engines	Total Output (MW)	Engine Speed (r/min)				Fuel (Units)		Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australasia	Central Asia	North Africa	Central, W., E. & S. Africa	North America	Central America	South America
			Below 300	300-600	720-1000	Above 1000	Diesel Oil	Heavy Fuel											
0.5-1.0	2644	1822		13	49	2582	2644		833	8	130	294	468	111	28	14	733	3	22
1.0-2.0	2147	2710	17	32	290	1808	2088	59	912	51	42	215	177	121	6	5	581	2	35
2.0-3.5	348	927	18	18	123	189	300	48	134	20	25	59	67	8			35		
3.5-5.0	174	716	32	37	76	29	96	78	69	11	2	72	12				8		
5.0-7.5	135	886	75	29	14	17	40	95	36			88	11						
7.5-15.0	320	3190	265	43	4	8	24	296	35	17		240	16		8		4		
15.0-30.0	94	1917	94					94	15	2		76							
30.0-50.0	18	667	18					18	3	2		13					1		
50.0 + above	27	1602	27					27				27							
Totals	5907	14 437	546	172	556	4633	5192	715	2037	111	199	1084	751	240	42	19	1362	5	57

*Geographic location is at the shipbuilding site

MARINE AUXILIARY GENERATING SET ORDERS, June 2002 – May 2003

Output Range (MW)	Number Auxiliary Units	Total Output (MW)	Engine Speed (r/min)			Fuel (Units)		Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australasia	Central Asia	North Africa	Central, W., E. & S. Africa	North America	Central America	South America
			300-600	720-1000	Above 1000	Diesel Oil	Heavy Fuel											
0.5-1.0	1528	1069		1114	414	605	923	337	4	8	1069	71	2		3	22	2	10
1.01 - 2.0	1102	1421		917	185	287	815	205	36	21	760	14	34			28	1	3
2.01 - 3.5	307	783		282	25	74	233	57			237	1		3		9		
3.51 - 5.0	35	148	2	28	5	13	22				29					6		
5.01 & above	2	10		2		2				2								
Totals	2974	3431	2	2343	629	981	1993	599	40	31	2095	86	36	3	3	65	3	13

*Geographic location is at the shipbuilding site

MARINE AUXILIARY GENERATING SET ORDERS, June 2001 – May 2002

Output Range (MW)	Number Auxiliary Units	Total Output (MW)	Engine Speed (r/min)			Fuel (Units)		Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australasia	Central Asia	North Africa	Central, W., E. & S. Africa	North America	Central America	South America
			300-600	720-1000	Above 1000	Diesel Oil	Heavy Fuel											
0.5-1.0	1577	1004		1154	423	487	1090	258	12	12	1063	117	56	1		31	6	21
1.01 - 2.0	803	1047		613	190	220	583	241	40	1	363	58	59			37	4	
2.01 - 3.5	258	627		194	64	105	153	65			89	77				26		1
3.51 - 5.0	34	112		30	4	8	26	7			18	5				4		
5.01 & above	7	52		7			7				7							
Totals	2679	2842		1998	681	820	1859	571	52	13	1540	257	115	1		98	10	22

*Geographic location is at the shipbuilding site

information and that output data will continue to be integrated into the overall mechanical drive survey.

As in previous reports, the survey period covers engine orders from a June 1 to May 31 timeframe and covers various output categories from 0.5 MW (500 kW) and above. Most of the world's marine engine builders, and their licensees, have participated in all facets of this survey, so that the information provided should be useful for comparison purposes and trend analysis.

Engine orders have increased in the mechanical drive and auxiliary generating surveys, while the diesel-electric survey continues to slip in orders and output. The mechanical drive unit orders are up 14.5% over 2002 and overall engine output is up 48%. Marine auxiliary generator engine orders also increased, with unit orders up 11% over 2002 and engine output is up about 21%. Diesel-electric engine orders were down again this year, off 29% from 2002 and total output decreased by almost 31%.

The combined output for all engines from the three surveys is up by 40% over last year, from 18 155 MW to 25 424 MW, while total units ordered are up by 12% from 8841 to 9920 units. The combined output increase is helped substantially by increases in the largest mechanical drive engine sizes, which were down last year. Engine order volume is affected by increases in the smaller size range engines in both the mechanical drive and auxiliary generating segments.

In terms of geographic location of the engines at the shipbuilder's site, the Far East saw the largest increase in activity, after decreasing last year. Southeast Asia also saw an increase in activity, while Western Europe was up slightly and North America was flat.

Mechanical Drive Orders

Total mechanical drive propulsion orders increased by 858 units this year, while total output increased by 6949 MW, which reflects significant unit order increases in both the smallest output categories (0.5 to 2.0 MW) and largest output categories (15 MW and above).

As for individual categories, unit increases were recorded in the smallest output ranges from 0.5 to 2.0 MW, with engines ordered up by 598 units and output increasing by 411 MW. Perhaps more significant are the increases in each of the largest output categories. In the 15 to 30 MW range engines, orders increased by 56% (147 vs. 94 in 2002). In the 30 to 50 MW range orders increased by 344% (80 vs. 18 in 2002). And in the 50+ MW range engines

increased by about 93% (52 vs. 27 in 2002). It is also noteworthy that engine orders in the 7.5 to 15 MW category also increased by 46% (468 vs. 320 in 2002).

Unit orders fell off from 2002 levels in the two output categories from 2.0 to 5 MW.

In the engine speed ranges, it is noteworthy that orders for slow-speed engines (300 r/min and below) increased by 41% from last year (770 vs. 546 in 2002), corresponding to the increase in high output engines. Beyond the slow-speed engines, each of the three remaining speed categories — 300 to 600 r/min, 720 to 1000 r/min and 1000+ r/min — were up by 28%, 14% and 11%, respectively.

With the significant increase in larger engines, fuel usage for mechanical drive diesels also reflected a 45% increase in heavy fuel. Engines fueled by diesel increased by roughly 10%. Both the engine speeds and fuel types reflect traditional patterns of diesel fuel for higher speed engines and heavy fuel for slower speed units, although there were also 19 heavy fuel engines in the lowest output category of 0.5 to 1.0 MW.

With regard to the geographic location of the shipbuilding site, the Far East, with a dominant position in large engine production, showed increases in all of the output categories — making up nearly 600 units of the 858 engine order increase (1682 vs. 1084 in 2002). This naturally reflects the major manufacturer's licensee activities, although it is also noteworthy that there was a 215 unit increase, or about 29%, in the regions encompassing Southeast Asia/Australasia. Western Europe was up slightly to 2175 units, while North America remained roughly flat compared to 2002.

Marine Auxiliary Gen-Sets

As it would be expected, the increase in mechanical drive engine orders has meant a corresponding increase in auxiliary engine generator set orders, although auxiliary gen-set orders have not increased in direct proportion to the mechanical drive engines, especially in the highest output categories. Marine auxiliary units totaled 2974 this year, an increase of 11% over last year's 2679 units. Total output increased from 2842 MW in 2002 to 3431 MW this year, an upswing of almost 21%.

Unit order growth was primarily centered in the two categories from 1.0 to 3.5 MW, which when combined reflected an increase of about 33%.

Fuel choice also produced some changes. There was a noticeable shift toward diesel-fueled engines in the smallest output category, although total units ordered in that category were down slightly from 2002. Heavy fuel, however, accounted for most of the increases in units in the two leading output ranges from 1.0 to 3.5 MW. Engine speeds mirrored 2002 levels across each speed range.

From the geographic location standpoint, engine orders were up primarily in the Far East (36%) from 1540 units in 2002 to 2095 units in 2003. The proper assumption is that the auxiliary generator set market closely follows the mechanical drive installations, thus the other geographic region totals mimic that survey.

Diesel-Electric Propulsion

Diesel-electric propulsion systems continue to be utilized in a wide variety of specialty vessel applications, although the units ordered is trending downward. With the overall numbers again down this year by 29% (181 vs. 255 in 2002), this would be further indication of weakness in the cruise shipbuilding industry — the most high profile users of diesel-electric propulsion systems. Total engine output ordered also decreased correspondingly by about 31%, from 876 MW in 2002 to 607 MW this year.

Order volume decreased, or remained flat, across every output category.

DIESEL-ELECTRIC MARINE PROPULSION ORDERS, June 2002 – May 2003

Output Range (MW)	Number of Diesel-Electric Propulsion Units	Total Output (MW)	Engine Speed (r/min)			Fuel (Units)		Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australasia	Central Asia	North Africa	Central, W., E. & S. Africa	North America	Central America	South America
			300-600	720-1000	Above 1000	Diesel Oil	Heavy Fuel											
0.5 - 1.0	16	13			16	16		10			6							
1.01 - 2.0	50	73		30	20	46	4	28					5			17		
2.01 - 3.5	73	170		40	33	73		32	1		12	10				18		
3.51 - 5.0	14	59		14		14		4				6					4	
5.01 - 7.5	6	41		4	2	6	0	2				4						
7.51 & above	22	251	22			8	14	6			8					8		
Totals	181	607	22	88	71	163	18	82	1		26	20	5			43	4	

*Geographic location is at the shipbuilding site

DIESEL-ELECTRIC MARINE PROPULSION ORDERS, June 2001 – May 2002

Output Range (MW)	Number of Diesel-Electric Propulsion Units	Total Output (MW)	Engine Speed (r/min)			Fuel (Units)		Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australasia	Central Asia	North Africa	Central, W., E. & S. Africa	North America	Central America	South America
			300-600	720-1000	Above 1000	Diesel Oil	Heavy Fuel											
0.5 - 1.0	34	30			34	34		12			22							
1.01 - 2.0	48	74		45	3	36	12	30	9		5					4		
2.01 - 3.5	106	263		75	31	76	30	60	2		6	4				34		
3.51 - 5.0	11	46		10	1	3	8	7			2					2		
5.01 - 7.5	23	153	4	15	4	13	10	15				4				4		
7.51 & above	33	310	33			16	17	11			3					19		
Totals	255	876	37	145	73	178	77	135	11		38	8				63		

*Geographic location is at the shipbuilding site

In contrast to the same size range of engines running on heavy fuel as auxiliary generators, diesel-electric system engines tend toward diesel fuel as they are the main propulsion systems for the vessels. It is also apparent that, for the most part, the geographic locations for these engines decreased correspondingly to those reported in 2002. Europe continues to hold a dominant position, nearly one-half of total orders, for diesel-electric engines at the shipbuilder's location. And although the numbers are relatively small, Southeast Asia/Australasia's numbers increased by 150%, from 8 units in 2002 to 20 units in 2003.

Engine operating speeds also continue to reflect the shift from larger to smaller engines. The 720 to 1000 r/min range decreased by 39%, but the 1000+ r/min decreased only 3%. The mid-range speed category remained unchanged. Fuel use also reflected the output change, with diesel fuel increasing by 13% and heavy fuel declining by 47%.

Overall Results

With the exception of the continued decline of diesel-electric orders, marine engine order activity worldwide is nearly back to the abundant levels of 2001. This is particularly apparent in the largest output ranges, regardless the type of engine service. One chief factor effecting this growth — especially in the smaller output ranges — is a worldwide building binge of security/patrol vessels (*please see accompanying article, this issue*). Although unfortunate in its root cause, the world's security matters have refocused many of the world's navies on upgrading their fleets.

Further regulation of the world's petroleum tankers also continues to spur investment in construction of double hull vessels. There is also a healthy demand for bulk carriers and continued activity in containerships.

Oil and gas exploration and drilling continues to benefit the construction of a variety of related vessels, with these newer, larger ships generally outfitted with more horsepower.

The marine surveys, combined with our 27th Annual Power Generation Order Survey (*D&GTW*, Oct. 2003), provide a fairly complete synopsis of the large reciprocating engine building business. Although engine order activity is down in the power generation sector, the marine marketplace is robust. For the engine builders serving both industries, this situation creates its own set of challenges as to how and where to best allocate development funds and sales resources.

As always, our sincere thanks to the engine manufacturers who invest time and effort in completing these marine order surveys — especially the mechanical drive propulsion order survey. It is this survey, along with the auxiliary generator set and diesel-electric propulsion order surveys, that give the most complete and accurate picture of the marine diesel market above 0.5 MW.

Mechanical Drive Marine Propulsion Manufacturers Participating and Reporting Orders in this Survey

- Caterpillar Engine Division (including Caterpillar Motoren)
- Cummins Marine
- Daihatsu Diesel Mfg.
- Electro-Motive Division
- Fairbanks Morse Engine
- Guascor
- Hyundai Heavy Industries Co. Ltd.
- Isotta Fraschini Motori
- IZAR Construcciones
- MAN B&W Diesel Group (including MAN B&W Ltd., Holeby, Augsburg, Copenhagen and licensees):
  - Dalian Marine Diesel Works, China;
  - Hudong Heavy Machinery Co., Ltd., China;
  - Shanghai HHM – Schangchuan Diesel Co. Ltd, China;
  - Yichang Marine Diesel Engine Plant, China;
  - Zhenjiang Marine Diesel Works, China;
  - Adria Diesel d.d., Croatia;
  - Brodosplit – Brodogradiliste d.o.o., Croatia;
  - Uljanik Strojogradna d.d., Croatia;
  - Hitachi Zosen Corporation, Japan;
  - Kawasaki Heavy Industries Ltd., Japan;
  - Makita Corporation, Japan;
  - Mitsui Engineering & Shipbuilding Co., Ltd., Japan;
  - Mitsubishi Heavy Industries Ltd., Japan;
  - HSD Engine Co., Ltd., Korea;
  - Hyundai Heavy Industries Co., Ltd., Korea;
  - STX Corp., Korea;
  - H. Cegielski, Poland;
  - Bryansk Engineering Works, Russia;
  - JSC Rumo, Russia;
  - IZAR Construcciones, Spain
- MTU Friedrichshafen (including Detroit Diesel)
- Mitsubishi Heavy Industries
- Niigata Engineering
- S.E.M.T. Pielstick
- Wärtsilä Corporation (including):
  - Wärtsilä Italia, Trieste;
  - Dalian Marine Diesel, China;
  - Yichang Marine Diesel Engine Plant, China;
  - 3MAJ, Croatia;
  - Diesel United Ltd., Japan;
  - Mitsubishi Heavy Industries, Japan;
  - HSD Engine Co., Ltd., Korea;
  - Hyundai Heavy Industries, Korea;
  - H. Cegielski, Poland
- Yanmar Diesel Engine

Marine Auxiliary Generating Unit Engine Manufacturers Participating and Reporting Orders in this Survey

- Caterpillar Engine Division (including Caterpillar Motoren)
- Cummins Marine
- Daihatsu Diesel Mfg.
- Fairbanks Morse Engine
- Guascor
- Hyundai Heavy Industries Co. Ltd.
- Isotta Fraschini Motori
- IZAR Construcciones
- MAN B&W Diesel Group (including licensees)
- MTU Friedrichshafen (including Detroit Diesel)
- Mitsubishi Heavy Industries
- Niigata Engineering
- Wärtsilä Corporation (including licensees)
- Yanmar Diesel Engine

Diesel-Electric Marine Propulsion Manufacturers Participating and Reporting Orders in this Survey

- Caterpillar Engine Division
- Fairbanks Morse Engine
- GE Transportation
- MAN B&W Diesel Group (including licensees)
- MTU Friedrichshafen (including Detroit Diesel)
- Wärtsilä Corporation