INTRODUCTION

Spears and Associates (Spears) was retained to prepare this industry consultant report (ICR) as part of the IPO process for Hilong Holding Limited.

Spears and Associates

Spears and Associates (Spears has provided market research-based consulting services to the worldwide petroleum industry since 1965, specializing in equipment and services used in exploration, drilling & completion, production, transportation and refining. Current and former clients include petroleum equipment manufacturers, oilfield service firms, oil and gas producers, financial institutions, trade associations, and the US government. Within this market Spears and Associates provides a wide scope of research and consulting services grouped in the following areas:

- Marketing/Sales—evaluation of market size and growth, market share, customer satisfaction, technology trends, selection criteria, purchasing process, and benchmarking.
- Business Development—strategic analysis for mergers and acquisitions, partnering, new technology development and introduction, and competitive analysis
- Finance/Planning—outlook for industry activity and price sensitivity analysis
- Corporate—strategic review, due diligence, and litigation support

In addition to its market research and consulting assignments, Spears and Associates produces three publications covering the upstream petroleum industry: the Drilling and Production Outlook (DPO); the Oilfield Market Report (OMR); and Pipe Logix.

The **DPO** has tracked and forecast worldwide drilling and production activity since 1981. It is a quarterly report that follows upstream activity—active rigs, wells and footage drilled, and spending to drill and complete wells—in over 50 countries. The **DPO** is used by over 100 oilfield equipment manufacturers and service firms and financial institutions to monitor worldwide oilfield activity, making it the most widely followed upstream activity forecast in the petroleum industry.

The **OMR** is an annual report that tracks worldwide upstream spending by producers for over 30 distinct product and service segments. In each segment the **OMR** identifies annual turnover for each of the leading vendors. In all, about 250 oilfield equipment and service firms are included in the report. In addition the OMR identifies recent consolidations and technology trends in each segment. The **OMR** is used by financial institutions and oilfield equipment and service firms to identify market growth and relative performance.

Pipe Logix is a suite of reports that analyze the OCTG market. The flagship publication is the ***Spot Market Price*** report, which provides average monthly prices for over 30 categories of pipe. The report covers the most popular sizes of tubing, production casing and surface casing. The ***Key Market Factors*** report is a concise presentation of the drivers to the OCTG industry. It is issued monthly and provides a history of OCTG shipments, OCTG imports, active rigs, wells drilled and other critical drivers to OCTG pricing. Every other month the ***Market Review and Outlook*** details the drivers, prices, imports/exports and provides commentary and other analysis on the business environment of the OCTG industry.

Research Methodology

Over the course of its research, Spears and Associates interviewed approximately 50 people to determine the size of the market, how it is structured, and how it is expected to develop in the future. These interviews were conducted with key industry participants, knowledgeable industry figures such as marketing managers, product managers, and other company executives. Spears and Associates research also relied on its proprietary database of oilfield market segment sales and its internal knowledge of oilfield equipment and service markets developed through working with many of the world's leading oilfield equipment and service companies. The research team also drew on publicly-available information on energy markets and measures of industry activity. The focus of Spears and Associates research and interviews was toward the oilfield drilling services market, the drill pipe market, and the line pipe and OCTG coating materials and services market.

SUMMARY

Oil and gas demand growth has and will continue to steer increasing investment across the global petroleum industry infrastructure, both upstream and downstream. Nowhere is petroleum demand and investment growing faster than in China.

The Hilong Group is well-positioned to take advantage of this trend, with a dominant position in the drill pipe and pipe coating markets that it serves in China providing the basis for a strong global position in these markets. Based on 2009 sales[1], we estimate that Hilong is the #1 supplier in the Chinese drill pipe market (with approximately 30% share), the leading supplier in the Chinese line pipe coating materials market (with approximately 60% of the market), and the leading supplier in the Chinese OCTG coatings materials and services market (with approximately two-thirds of the market). Based on 2009 sales, we estimate that the Hilong Group is the #2 supplier in the global drill pipe market (with 13% share), and the #2 supplier in the global OCTG materials and coating services market (with a 12%% share). We believe that Hilong's position in both China and the global market in both drill pipe and OCTG coating materials and services did not materially change in 2010.

Going forward, Hilong's strategy of moving into the $25 billion global contract drilling market by vertically integrating drill pipe manufacturing/coating and contract drilling could potentially allow it to have a significant cost advantage over contract drilling competitors which must source their drill pipe from third parties at market prices. In addition, it may be able to leverage proprietary drill pipe R&D information in such as way as to achieve superior drilling performance. In turn, its presence in the contract drilling market is expected to allow Hilong to identify opportunities in related markets, as it has already with mud engineering services (a $1.3 billion global market) and cementing services (a $7.7 billion global market).

1 Throughout this report, sales of associates and jointly controlled entities calculated based on our equity interests in such entities have been included for purposes of calculating Hilong's market share.

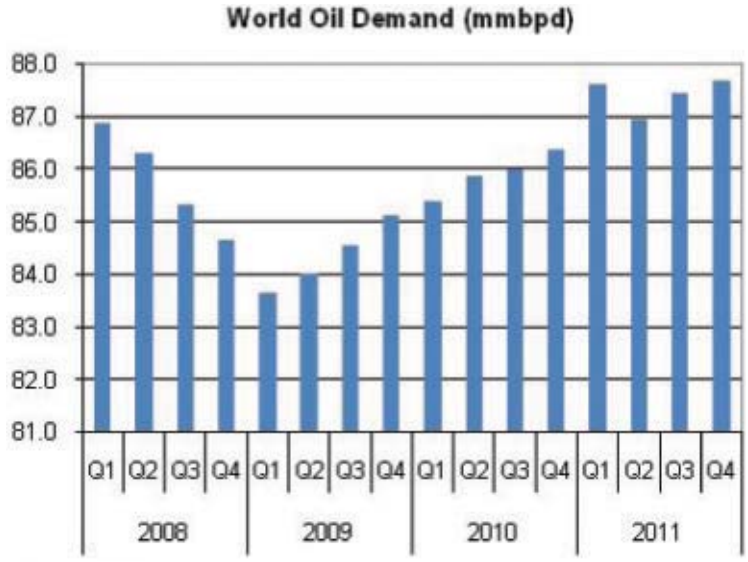
MACRO DEMAND DRIVERS AND INDUSTRY TRENDS

Macro Drivers for Drill Pipes/OCTG Coatings/Drilling Services

Oil Prices

Although many signs point to the fact that the global economic recovery remains disturbingly sluggish and fragile, oil markets appear to be functioning normally, subject to the usual seasonal fluctuations surrounding inventories, supply, and demand. We continue to expect that US spot oil prices will trade in the $70 to $80/bbl range for the balance of this year and next, providing an attractive return on their investment for most producers.

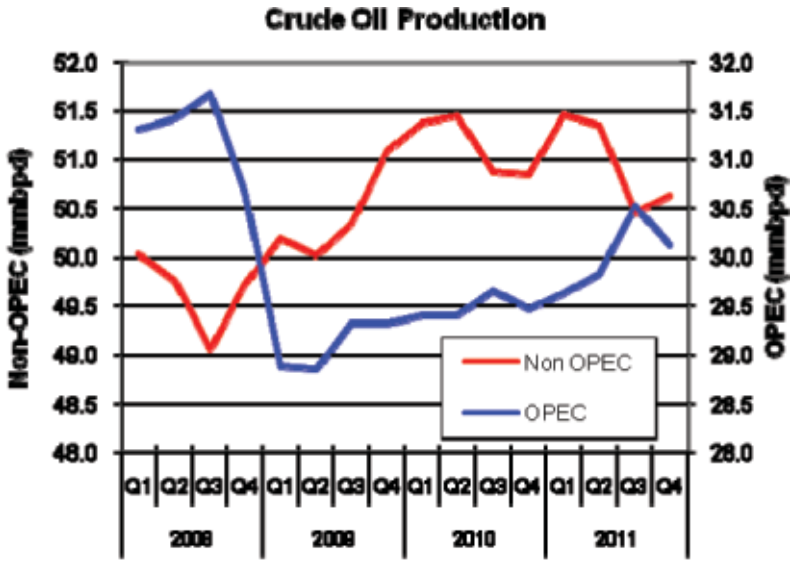
Official sources (EIA, IEA) continue to forecast that global oil demand will continue to grow over the balance of this year and next, despite increasing worries that the economic recovery now underway in the US will slow, though it should be noted that in the most recent round of forecasts the outlook for 2011 growth was trimmed, however slightly. The current projection calls for global oil consumption to increase 1.9% in 2010 to 85.9 mmbpd and grow 1.8% in 2011 (to 87.4 mmbpd).



Source: EIA

As has been the case in prior forecasts, most of the expected growth in world oil demand is expected to come from "emerging markets", primarily China, Saudi Arabia, and Brazil. Among "industrialized" countries, only the US is expected to show significant increases in oil consumption of about 150,000 bpd in both 2010 and 2011.

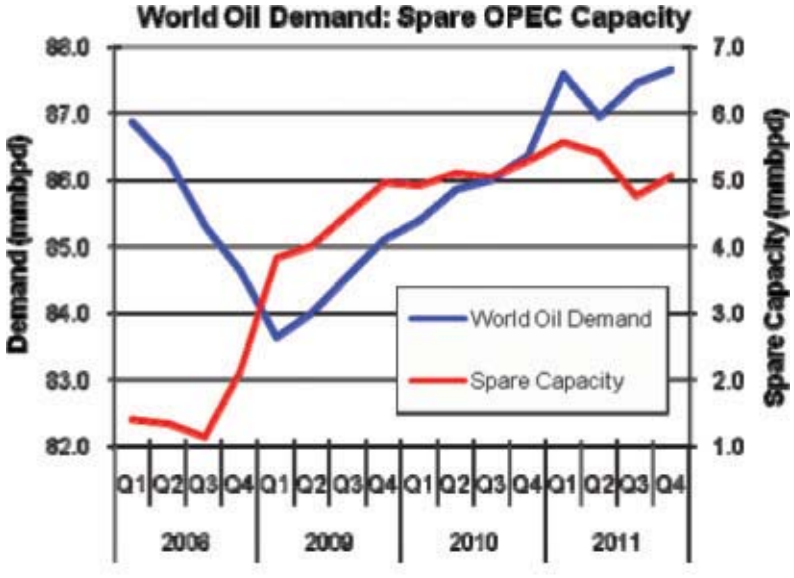
The EIA now projects that non-OPEC supply will increase by 720,000 bpd in 2010, led by gains in the US (largely from the Williston basin), Brazil, and Azerbaijan. Looking ahead to 2011, non-OPEC supply is expected to fall slightly (160,000 bpd) as declining production in mature areas such as the North Sea and Mexico offsets production growth in other areas; this represents only the third time since 1995 that non-OPEC production will decline. However, the 2011 estimates of non-OPEC supply do not appear to take into account a prolonged moratorium on issuing deepwater drilling permits in the Gulf of Mexico as a result of BP's oil spill. As a result, 2011 non-OPEC supplies may be overstated.



Source: EIA, Spears

It should be noted that at current drilling levels, crude production from the Williston basin is projected to increase approximately 400,000 bpd by 2015. Such an increase may be sufficient to maintain overall US oil production even in the face of a slowdown in deepwater GOM development activity following the Macondo oil spill.

As shown on the following chart, spare oil production capacity in the hands of OPEC member nations remains around 5.0 mmbpd (~15% of OPEC's production capacity) as it has since late last year. It is expected to remain at or above this level over the balance of this year and through 2011. With world oil demand currently growing at an annual rate of about 1.5 million bpd, OPEC's spare capacity equates to 3+ years of demand growth.

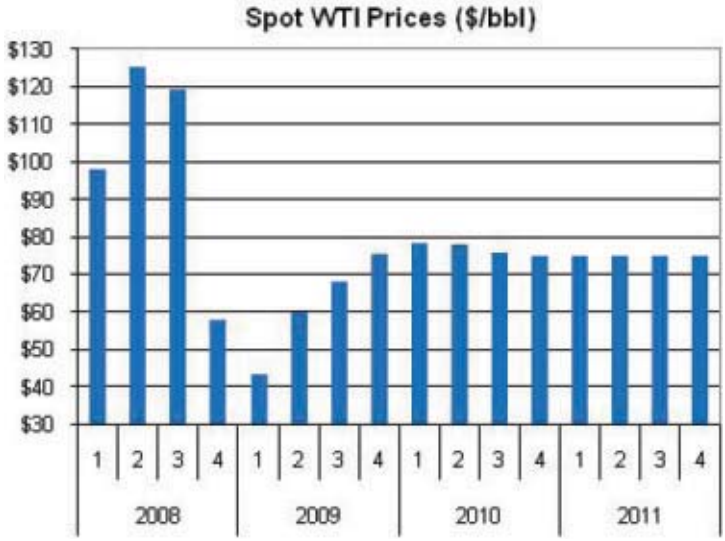


Source: EIA

We estimate that US spot oil prices will average about $76.75/barrel in 2010, up 24% for the year.

Given aggressive field development plans in Canada (oilsands), Brazil, and Kazakhstan, combined with sluggish oil demand growth in "industrialized" countries, it seems likely that spare OPEC capacity will remain around 5 million bpd, leaving the oil market well supplied over the short-to-mid term.

As a result, we continue to expect that US spot oil prices will trade in the $70-$80/bbl range over the 2011 to 2012 timeframe and in the $75-$85/bbl range after 2012.



Drilling Activity Outlook

North America

Although US gas drilling has plateaued in recent months, we continue to forecast that overall US gas production capacity will climb throughout the balance of 2010 because the increase in gas rig activity has been concentrated in the highly-productive shale plays. We now estimate that excess US gas production capacity will increase from about 1.4 bcfd in Q4 2009 to about 2.5 bcfd in Q4 2010, a gain of about 75% over this timespan. As a result of this continuing surplus, we project that spot US gas prices will continue to come under severe pressure, struggling to remain near $4/mmbtu until the return of colder weather in the November-December timeframe. Looking ahead, we project that spot gas prices will average $4.30/mmbtu in 2011, little changed from this year's level. However, our gas deliverability model suggests that if gas drilling does slowdown in 2011 and gas demand continues to grow at least slowly that the gas market will tighten appreciably in 2012.

In all, we now project that US rig count will average 1,535 active units for the year, up 41% for the year; activity is projected to grow 13% in 2011. We project that US oil drilling activity will continue to grow over the balance of this year and next in line with its rate of growth over the past five quarters. In recent months the growth in gas drilling activity has come to a halt in the face of sub-$5 gas prices. Based on our expectation that low gas prices will persist for the rest of 2010 and much of 2011, we expect gas drilling activity to slow over the balance of this year and next.

How quickly gas drilling activity will slow and how far it will fall is influenced by the fact that operators are under pressure in many locations to drill or lose the lease. In addition, the increased financing by majors in gas shale plays will also help sustain activity. However, we estimate that gas drilling activity will have to decline about 20% from now to the end of 2011 in order to keep US gas production capacity from growing and putting further pressure on gas prices to move lower.

Taken in combination—rising oil drilling activity and falling gas drilling activity—we project that overall rig count will continue to rise but at a slower pace than in recent quarters.

Our 2010 Canadian rig forecast now calls for an average of 358 active units in 2010, up 60% for the year; activity is projected to grow another 14% in 2011. In addition to conventional oil and gas production, oil sands activity has recovered smartly in 2010, and all signs point toward increased activity in 2011. Oilsands spending is projected to reach C$13 billion in 2010, up from C$2 billion in 2009, in part due to funding from Chinese firms that have recently taken an ownership position in several oilsands ventures.

	NORTH AMERICA											
	RIGS			WELLS			FOOTAGE (MIL)			SPENDING (MIL)		
	Land	Off	Total	Land	Off	Total	Land	Off	Total	Land	Off	Total
2000	1,118	144	1,263	47,509	1,434	48,944	200.7	14.2	214.9	$ 19,320	$ 9,106	$ 28,426
2001	1,339	158	1,497	53,303	1,534	54,837	237.2	15.8	253.0	$ 28,413	$14,082	$ 42,495
2002	975	118	1,094	43,113	874	43,987	199.1	9.3	208.4	$ 24,755	$10,354	$ 35,109
2003	1,291	112	1,403	53,724	922	54,647	249.5	9.7	259.3	$ 34,645	$13,282	$ 47,928
2004	1,455	101	1,556	61,336	878	62,214	286.4	9.5	295.9	$ 61,605	$13,139	$ 74,745
2005	1,741	97	1,838	70,907	802	71,709	343.3	8.9	352.3	$ 76,439	$16,297	$ 92,735
2006	2,026	94	2,120	75,070	777	75,847	379.4	8.3	387.7	$110,590	$27,525	$138,115
2007	2,035	75	2,110	70,025	650	70,675	374.4	7.2	381.6	$121,704	$23,574	$145,278
2008	2,194	66	2,261	73,367	579	73,946	409.5	6.4	415.9	$148,266	$22,606	$170,872
2009	1,265	45	1,310	42,938	397	43,334	258.8	4.4	263.3	$ 79,308	$12,604	$ 91,911
2010 Q1	1,734	48	1,782	15,361	103	15,464	87.8	1.2	89.0	$ 26,818	$ 3,375	$ 30,193
Q2	1,625	43	1,669	14,106	94	14,200	82.6	1.1	83.7	$ 27,091	$ 3,110	$ 30,200
Q3	1,977	21	1,998	17,363	45	17,408	99.6	0.5	100.1	$ 32,104	$ 1,587	$ 33,691
Q4	2,095	25	2,120	19,132	54	19,186	106.3	0.6	106.9	$ 34,229	$ 1,901	$ 36,129
Total	1,858	34	1,892	65,962	296	66,258	376.3	3.4	379.7	$120,241	$ 9,971	$130,212
2011 Q1	2,185	28	2,213	20,152	60	20,212	110.8	0.7	111.5	$ 36,346	$ 2,250	$ 38,596
Q2	1,914	33	1,947	17,333	71	17,404	97.7	0.8	98.5	$ 33,362	$ 2,615	$ 35,977
Q3	2,137	28	2,165	19,575	60	19,635	108.5	0.7	109.2	$ 36,092	$ 2,250	$ 38,343
Q4	2,192	33	2,225	20,146	71	20,217	111.4	0.8	112.2	$ 36,899	$ 2,615	$ 39,514
Total	2,107	31	2,138	77,206	262	77,468	428.5	3.0	431.5	$142,700	$ 9,730	$152,430
2012	2,153	31	2,184	78,920	267	79,187	437.9	3.0	440.9	$148,852	$10,106	$158,957
2013	2,213	32	2,245	80,959	277	81,237	449.9	3.2	453.1	$156,303	$10,685	$166,988
2014	2,272	33	2,306	83,002	288	83,290	461.9	3.3	465.2	$163,991	$11,276	$175,268
2015	2,322	34	2,356	84,784	294	85,079	472.0	3.4	475.4	$171,183	$11,765	$182,948
2016	2,371	35	2,406	86,560	301	86,861	482.1	3.5	485.5	$178,562	$12,256	$190,818

Sources: Baker Hughes, Spears and Associates

Rest of World

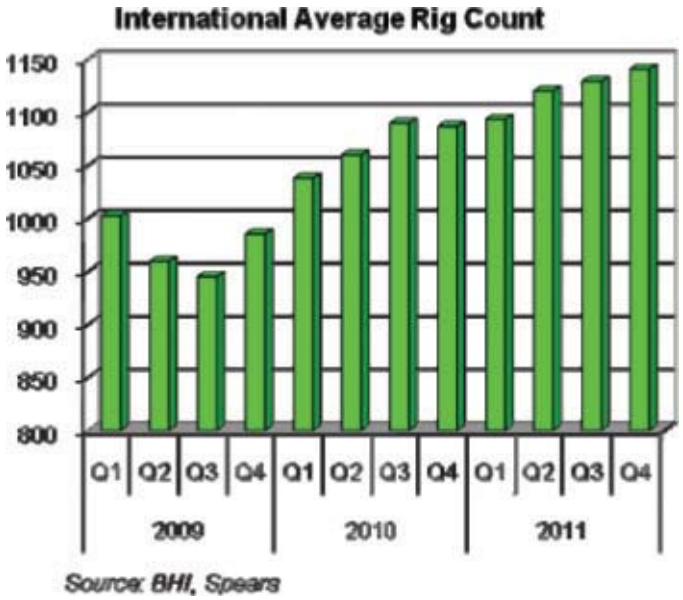
Overall International rig activity[2] has risen sharply after touching bottom in Q3 2009 and now stands back at the level of the most recent cyclical peak (reached in September 2008). In an environment in which oil and gas prices are significantly lower than what they were in Q3 2008 and the outlook is for little or no growth in commodity prices over the short-to-mid term, we think that most of the bounce in drilling activity off the bottom has already taken place. As a result, we expect further gains in overall International rig count over the balance of this year and next to be limited. Overall International rig activity is expected to rise 10% in 2010 and 5% in 2011. On a regional basis the outlook for activity remains quite varied: Africa (up 27% in 2010 and up 6% in 2011), Europe (up 9% in 2010 and up 5% next year), the Far East (up 8% this year and up 5% in 2011), Central and South America (up 8% in 2010 and up 6% next year), and the Mid East (up 5% in 2010 and up 3% in 2011).

As Europe follows North America into a market where oil and gas prices are decoupled (and gas prices have fallen), gas export projects in Europe, Russia, North Africa, and elsewhere seeking to serve Europe will have to review their economics in light of the new lower-priced environment. As a result, some new projects may be thrown into doubt.

2 "International rig activity" includes rigs working in South America, Europe, Africa, the Mid East and the Far East, but excludes rigs working in North America, Russia, China, and Central Asia.

Our updated outlook for 2010 is that overall international drilling activity will rise 10% to an average of 1,068 active rigs (as measured by Baker Hughes), accounting for a total of 14,053 wells and 97.5 million feet of hole drilled. In 2010 onshore activity is projected to rise 9% to an average of 790 active rigs accounting for 11,197 new wells drilled and 69.5 million feet of hole. Offshore rig count is projected to rise 11% in 2010 and average 278 active units accounting for 2,856 new wells and 28.0 million feet of hole drilled. While overall International rig activity is expected to rise 10% in 2010, regional trends are projected to diverge, as follows: Africa (+27%), Europe (+9%), the Far East (+8%), Central and South America (+8%), and the Mid East (+5%).

Our 2011 outlook calls for overall international drilling activity to rise 5% to an average of 1,120 active rigs (as measured by Baker Hughes), accounting for a total of 14,705 wells and 102.0 million feet of hole drilled. In 2011 onshore activity is projected to rise 4% to an average of 824 active rigs accounting for 11,636 new wells drilled and 72.0 million feet of hole. Offshore rig count is projected to rise 7% in 2011 and average 297 active units accounting for 3,089 new wells and 30.0 million feet of hole drilled. Overall International rig activity is expected to rise 5% in 2011, with regional trends as follows: Africa (+6%), Central and South America (+6%), the Far East (+5%), Europe (+5%), and the Mid East (+3%).



Overall International rig activity has risen sharply after touching bottom in Q3 2009 and now stands back at the level of the most recent cyclical peak (reached in September 2008). In an environment in which oil and gas prices are significantly lower than what they were in Q3 2008 and the outlook is for little or no growth in commodity prices over the short-to-mid term, we think that most of the bounce in drilling activity off the bottom has already taken place. As a result, we expect further gains in overall International rig count over the balance of this year and next to be limited. The opportunity for outsized gains in drilling activity are likely to come in markets where operators have made significant new discoveries (i.e., Brazil) or markets starved for new supplies either due to rapidly-growing demand or rapidly-falling reserves (i.e., Argentina).

	INTERNATIONAL											
	RIGS			WELLS			FOOTAGE (MIL)			SPENDING (BIL)		
	Land	Off	Total	Land	Off	Total	Land	Off	Total	Land	Off	Total
2000	466	177	643	6,070	1,907	7,977	36.0	17.7	53.6	$14.2	$20.9	$ 35.1
2001	525	209	734	7,423	2,195	9,618	46.6	20.8	67.5	$18.6	$24.9	$ 43.5
2002	507	216	723	7,091	2,063	9,154	44.3	20.6	64.8	$18.9	$24.3	$ 43.2
2003	543	217	761	7,630	2,108	9,737	46.4	20.4	66.8	$20.4	$25.9	$ 46.3
2004	594	231	825	7,961	2,134	10,095	49.4	21.4	70.8	$21.2	$26.3	$ 47.5
2005	643	250	893	8,464	2,362	10,826	52.9	23.9	76.8	$25.5	$31.1	$ 56.7
2006	656	252	909	9,329	2,611	11,940	59.2	25.4	84.7	$31.5	$38.3	$ 69.8
2007	720	267	987	10,240	2,687	12,926	64.4	26.0	90.3	$37.9	$43.7	$ 81.7
2008	784	275	1,058	11,138	2,886	14,024	69.2	28.0	97.2	$44.3	$51.5	$ 95.8
2009	722	251	973	10,426	2,582	13,008	65.3	25.5	90.8	$45.1	$49.7	$ 94.9
2010 Q1	769	269	1,038	2,758	688	3,446	17.2	6.7	23.9	$10.8	$12.2	$ 23.0
Q2	782	278	1,060	2,775	704	3,479	17.3	6.9	24.2	$10.9	$12.3	$ 23.2
Q3	803	286	1,089	2,821	739	3,560	17.5	7.2	24.7	$11.1	$13.0	$ 24.2
Q4	806	280	1,086	2,843	726	3,569	17.5	7.1	24.6	$11.2	$12.8	$ 24.0
Total	790	278	1,068	11,197	2,856	14,053	69.5	28.0	97.5	$44.0	$50.3	$ 94.4
2011 Q1	805	288	1,093	2,834	746	3,580	17.5	7.3	24.8	$11.2	$13.2	$ 24.4
Q2	824	296	1,120	2,907	766	3,673	18.0	7.5	25.5	$11.4	$13.6	$ 25.0
Q3	828	301	1,129	2,930	779	3,709	18.1	7.6	25.7	$11.5	$13.9	$ 25.4
Q4	839	301	1,140	2,966	778	3,743	18.4	7.6	26.0	$11.6	$13.9	$ 25.5
Total	824	297	1,120	11,636	3,069	14,705	72.0	30.0	102.0	$45.7	$54.6	$100.3
2012	843	307	1,150	11,838	3,175	15,013	73.4	31.3	104.7	$46.9	$57.3	$104.1
2013	866	319	1,18 5	12,135	3,289	15,424	75.3	32.4	107.7	$50.5	$62.4	$112.9
2014	890	331	1,221	12,425	3,409	15,834	77.1	33.5	110.6	$54.3	$68.0	$122.3
2015	914	344	1,259	12,730	3,536	16,266	79.0	34.7	113.7	$58.4	$74.2	$132.7
2016	940	358	1,299	13,047	3,672	16,719	81.0	36.0	117.0	$62.9	$81.1	$144.0

Sources: Baker Hughes, Spears and Associates

Activity in China is forecast to rise 2% in 2010 after having dropped 6% last year. Drilling is expected to climb 1% in 2011 as work shifts toward offshore oil development and onshore gas exploration and development.

Recently China's National Development and Reform Commission increased the wellhead price of domestically-produced onshore gas by 23%, to $4.78/mcf. In addition, sellers are allowed to charge up to 10% above or below the new price. The higher price is expected to help boost onshore gas production efforts by PetroChina and Sinopec, as well as dampen gas demand growth which has been running at the rate of 10% per year.

PetroChina will drill 327 CBM wells at its Hancheng field over a two-year period ending in 2010. Most of its CBM potential is located in the Xinjiang province of northwest China. PetroChina and BP have agreed to form a partnership to develop CBM reserfves in the Shaerhu block of the Tula basin in the Xinjiang province.

Chevron will drill 14 production wells from four pads and build a gas plant as part of its first phase development of the Chuandongbei sour gas development in the Sichuan province. First gas is expected to flow by the end of 2011. Phases 2 (developing the Tieshanpo field) and 3 (developing the Dukuohe and Qilibei fields) each would involve constructing three well pads.

PetroChina has taken over development of the Sulige South tight gas field from Total. PetroChina already operates the nearby Sulige North field, which produced 1.75 mmcfd in 2009 from 800 wells, up almost four-fold from 2008. Well costs at Sulige North are about 8 million yuan ($1.18 million) and gas is priced at about $2.84/mcf.

PetroChina is stepping up gas exploration and development at the Daqing field. Gas output from the field is expected to reach 400 mmcfd in 2015, up from 100 mmcfd in 2010. Most of Daqing's gas reserves are located in

volcanic reservoirs at an average depth of 4,000 meters (13,200 feet). The key gas field in the region, Xuchen, also has high CO2 content. PetroChina is developing the Tazhong-1 gas field in the Tarim basin, with production to eventually reach 2 bcfd.

CHINA

	RIGS			WELLS			FOOTAGE (MIL)			SPENDING (MIL)		
	Land	Off	Total	Land	Off	Total	Land	Off	Total	Land	Off	Total
2000	670	9	679	10,001	54	10,055	53.5	0.4	53.9	NA	$ 940	NA
2001	670	11	681	9,751	63	9,814	51.7	0.5	52.2	NA	$1,080	NA
2002	641	9	650	9,946	53	9,999	76.6	0.6	77.2	NA	$ 905	NA
2003	615	10	625	12,234	59	12,293	93.0	0.7	93.7	NA	$1,008	NA
2004	681	11	692	13,077	165	13,242	96.8	1.8	98.5	NA	$2,300	NA
2005	765	15	780	16,202	220	16,422	119.9	2.3	122.2	NA	$2,900	NA
2006	863	17	880	16,040	244	16,285	120.3	2.6	122.9	NA	$3,544	NA
2007	870	19	889	16,361	273	16,634	122.7	2.9	125.6	NA	$4,358	NA
2008	868	20	888	18,161	288	18,448	136.2	3.1	139.3	NA	$5,046	NA
2009	814	24	838	15,255	342	15,597	114.4	3.6	118.1	NA	$5,404	NA
2010	822	30	852	15,408	431	15,839	115.6	4.6	120.1	NA	$6,130	NA
2011	830	31	861	15,562	446	16,008	116.7	4.7	121.5	NA	$6,335	NA
2012	839	31	870	15,717	450	16,168	117.9	4.8	122.7	NA	$6,398	NA
2013	847	32	879	15,875	455	16,329	119.1	4.8	123.9	NA	$6,785	NA
2014	856	32	887	16,033	459	16,493	120.3	4.9	125.1	NA	$7,196	NA
2015	864	32	896	16,194	464	16,658	121.5	4.9	126.4	NA	$7,631	NA
2016	873	33	905	16,356	468	16,824	122.7	5.0	127.7	NA	$8,093	NA

Sources: CNPC (land rigs), Baker Hughes (offshore rigs), Spears and Associates

Russian drilling is projected to rise 5% in 2010, followed by a 6% increase next year. However, a proposal to raise the oil production tax later this year in order to close the government's budget deficit may cut funding available for field development projects[3].

The Russian Finance Ministry has proposed increasing taxes on oil and gas as a way to reduce the government's budget deficit. One proposal is to increase the tax on gas production from $0.14 per mcf to $0.22 per mcf and then index it to inflation after 2011. The ministry has also proposed indexing the oil production tax, which is currently about $13 per bbl, to inflation starting in 2012.

RUSSIA

	RIGS			WELLS			FOOTAGE (MIL)			SPENDING (MIL)		
	Land	Off	Total	Land	Off	Total	Land	Off	Total	Land	Off	Total
2000	40	0	40	4,714	5	4,719	33.8	0.1	33.9	$ 5,073	$ 50	$ 5,123
2001	76	1	77	5,140	5	5,145	36.9	0.1	36.9	$ 5,532	$ 50	$ 5,582
2002	71	1	73	4,401	5	4,406	31.0	0.1	31.1	$ 4,654	$ 50	$ 4,704
2003	325	2	327	4,505	5	4,510	31.5	0.1	31.6	$ 4,730	$ 50	$ 4,780
2004	355	2	356	3,527	10	3,537	29.5	0.1	29.6	$ 4,418	$100	$ 4,518
2005	439	1	440	3,802	10	3,812	32.1	0.1	32.2	$ 4,819	$100	$ 4,919
2006	539	2	541	4,715	10	4,725	39.8	0.1	39.9	$ 5,976	$100	$ 6,076
2007	648	4	652	5,587	10	5,597	47.2	0.1	47.3	$ 7,789	$110	$ 7,899
2008	734	5	740	6,331	20	6,351	53.5	0.2	53.7	$ 9,710	$242	$ 9,952
2009	758	4	761	6,532	20	6,552	55.2	0.2	55.4	$ 9,016	$218	$ 9,234
2010	790	10	800	6,812	20	6,832	57.6	0.2	57.8	$ 8,462	$196	$ 8,658
2011	835	14	849	7,200	20	7,220	60.8	0.2	61.0	$ 9,392	$206	$ 9,597
2012	852	14	866	7,344	25	7,369	62.1	0.3	62.3	$10,058	$270	$10,329
2013	869	15	883	7,491	25	7,516	63.3	0.3	63.5	$10,773	$284	$11,056
2014	886	15	901	7,641	30	7,671	64.6	0.3	64.9	$11,537	$357	$11,895
2015	904	15	919	7,793	30	7,823	65.9	0.3	66.2	$12,357	$375	$12,732
2016	922	15	937	7,949	30	7,979	67.2	0.3	67.5	$13,234	$394	$13,628

Sources: M-I Swaco, Spears and Associates

3 It should be noted that measurement of Russia rig activity was incomplete prior to 2003.

A final investment decision on the $15 billion Shtokman first phase development project is due by March 2011. First pipeline gas is expected in 2016 while first LNG exports are projected for 2017. Lukoil hopes to start production from its Caspian Sea fields (Filanovskogo, 2017; Sarmatskoye, 2016; Khazri, 2018), but is likely to need some tax relief assistance from the government before pursuing these projects due to their low reserve figures.

Rig count in Central Asia (Kazakhstan, Turkmenistan, and Azerbaijan) continues to move ahead; a 3% increase in activity is currently forecast for 2011 following a 5% gain this year. Drilling activity in this region still remains below its 2008 peak, but has stabilized in recent months. Little change from the current level is expected before 2011[4].

As of July 2010 M-I Swaco reported a total of 88 drilling rigs (87 onshore; one offshore) working in Kazakhstan. Completion of the giant Kashagan oilfield's second phase development may be delayed to 2018 or 2019 after the Kazakhstan government ordered a review of the project costs. Phase 1 is expected to come onstream at 450,000 bpd in 2012, while phase 2 had been projected to increase output to 1.0 million bpd. KazMunaiGas Exploration Production is projected to almost double its capital spending in 2010 to $555 million, of which about half is earmarked for development drilling. It hopes to increase output from the current level of 280,000 bpd to 460,000 bpd by 2020. KNOC leads a consortium that will begin exploring the offshore Zhambyl prospect in 2012. The field is estimated to hold up to 1 billion barrels of oil. The next development phase at Chevron's Tengiz oilfield could add between 250,000 bpd and 300,000 bpd, taking overall output up to 900,000 bpd between 2014 and 2016.

As of July 2010 M-I Swaco reported a total of 130 drilling rigs (126 land; four offshore) working in Turkmenistan. Dragon Oil plans to spud 35 development wells at its offshore Lam block in Turkmenistan between 2010 and 2020. Well depth in the area is about 11,000 feet. Chevron, ConocoPhillips, TXOil and Mubadala Oil & Gas were chosen as preferred bidders for offshore exploration blocks #9 and #20. In all, there are 32 blocks up for tender in the current round.

	CENTRAL ASIA											
	RIGS			WELLS			FOOTAGE (MIL)			SPENDING (MIL)		
	Land	Off	Total	Land	Off	Total	Land	Off	Total	Land	Off	Total
2000	11	3	14	460	13	473	2.4	0.1	2.5	$ 362	$ 133	$ 496
2001	18	4	22	705	17	722	4.0	0.2	4.2	$ 603	$ 167	$ 769
2002	33	6	39	720	25	745	4.0	0.2	4.2	$ 594	$ 247	$ 841
2003	60	6	66	715	24	739	3.9	0.2	4.1	$ 579	$ 240	$ 819
2004	187	7	194	815	27	842	4.4	0.3	4.7	$ 660	$ 273	$ 933
2005	173	8	181	800	34	834	4.8	0.3	5.1	$ 720	$ 337	$1,057
2006	180	15	195	1,024	46	1,070	6.8	0.5	7.2	$1,014	$ 457	$1,470
2007	212	26	239	1,042	58	1,100	6.9	0.6	7.5	$1,135	$ 634	$1,769
2008	248	33	281	1,070	80	1,150	7.1	0.8	7.9	$1,282	$ 964	$2,246
2009	227	31	258	982	74	1,056	6.5	0.7	7.2	$1,059	$ 804	$1,864
2010	233	37	270	1,007	89	1,096	6.6	0.9	7.5	$ 977	$ 871	$1,848
2011	240	38	278	1,038	92	1,129	6.8	0.9	7.8	$1,007	$ 897	$1,904
2012	247	39	286	1,069	94	1,163	7.1	0.9	8.0	$1,037	$ 924	$1,961
2013	255	40	295	1,101	97	1,198	7.3	1.0	8.2	$1,121	$ 999	$2,121
2014	262	42	304	1,134	100	1,234	7.5	1.0	8.5	$1,213	$1,081	$2,294
2015	270	43	313	1,168	103	1,271	7.7	1.0	8.7	$1,312	$1,169	$2,481
2016	278	44	322	1,203	106	1,309	7.9	1.1	9.0	$1,419	$1,264	$2,683

Sources: M-I Swaco, Spears and Associates

As of July 2010 M-I Swaco reported a total of 55 drilling rigs (23 land; 32 offshore) working in Azerbaijan. Work on BP's Chirag Oil Project offshore Azerbaijan will involve drilling up to 16 development wells and building a new 48-slot production platform for the field. Drilling on this project will begin in Q4 2010. First production is slated for 2013 at 185,000 bpd of oil and 60 mmcfd of gas. After the Chirag project is complete BP is looking at phase 4 development of the Azeri oilfield.

4 It should be noted that measurement of rig count was incomplete in Central Asia until 2003.

GLOBAL OILFIELD DRILLING SERVICES MARKET

Description

The oilfield drilling services market as addressed in this study includes the following services: onshore contract drilling, mud engineering, and cementing.

Onshore contract drilling is performed by a company (the drilling contractor) that owns and operates a drilling rig. The drilling contractor usually charges a fixed daily rate for the use of its rig and crew, plus certain operating expenses such as mobilizing/demobilizing the rig, fuel, etc.

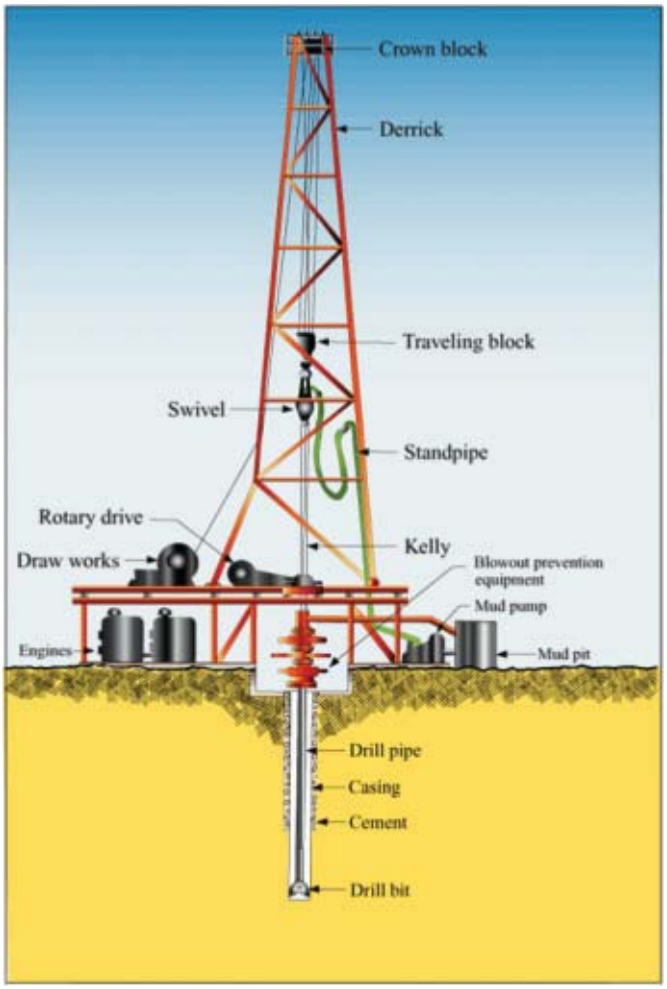


Figure 1: Schematic of an onshore drilling rig

Land contract drilling is characterized as a highly fragmented, localized, cyclical, business. When demand drops, rig rates fall quickly toward cash costs as contractors take steps to keep their rig utilization high. As utilization exceeds 90%, day rates begin rise quickly since supply is inelastic.

In North America most rigs are hired only on a per-well or short-term basis and serve the market within a 50 mile radius from its yard. Internationally most rigs work under long-term (up to three year) day rate contracts, but rigs rarely cross national borders in order to secure contracts.

Mud engineering consists of testing the drilling fluids (mud) at a rig and prescribing mud treatments to maintain mud weight, properties and chemistry to optimize mud performance. Mud companies almost always

have a mud engineer on duty at the rig, either on a full-time or part-time basis. The mud engineer may be provided by the mud company providing the product to the customer (typical in North America) or hired separately by the operator from a third party not associated with the products used (typical outside North America).

Cementing takes place when cement is prepared and pumped into place in a wellbore. Cementing operations may be performed in order to seal the annulus after a casing string has been run, to seal a lost circulation zone, to set a plug in a well in order to assist in further drilling, or to plug a well so that it may be abandoned. A cementing crew uses special mixers and pumps to displace drilling fluids and place cement in the wellbore. For a new well, cementing typically takes place three or four times during the drilling process: to set conductor pipe, to set surface casing, to set intermediate casing, and to set production casing.

Market Size

Onshore Contract Drilling

It is estimated that the global onshore contract drilling market totaled $25.3 billion in 2009, of which North America was the largest regional market (38%), followed by South America (14%), China (12%), and Russia (11%)[5].

The global onshore contract drilling market is projected to increase at a 7.8% CAGR over the 2009 to 2015 timeframe, reaching $39.8 billion in 2015.

Onshore Contract Drilling Market ($ Billion)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	$ 2.8	$ 3.1	$ 3.2	$ 3.2	$ 3.0	$ 3.0	$ 3.1	$ 3.2	$ 3.4	$ 3.5	$ 3.7
North America	$10.3	$15.4	$15.6	$16.8	$ 9.5	$13.2	$15.4	$16.3	$17.2	$18.2	$19.2
South America	$ 1.7	$ 2.1	$ 2.9	$ 3.7	$ 3.6	$ 3.5	$ 3.8	$ 4.0	$ 4.2	$ 4.4	$ 4.7
Europe	$ 0.1	$ 0.2	$ 0.2	$ 0.5	$ 0.4	$ 0.4	$ 0.4	$ 0.5	$ 0.5	$ 0.5	$ 0.5
Africa	$ 0.5	$ 0.6	$ 0.9	$ 1.2	$ 1.1	$ 1.1	$ 1.2	$ 1.3	$ 1.4	$ 1.6	$ 1.7
Mid East	$ 1.1	$ 1.3	$ 1.9	$ 2.2	$ 2.2	$ 2.0	$ 2.1	$ 2.2	$ 2.3	$ 2.4	$ 2.5
Far East	$ 0.9	$ 1.1	$ 1.5	$ 1.9	$ 2.0	$ 1.9	$ 2.0	$ 2.1	$ 2.3	$ 2.4	$ 2.6
Russia	$ 1.6	$ 2.0	$ 2.4	$ 2.7	$ 2.8	$ 2.9	$ 3.1	$ 3.3	$ 3.5	$ 3.6	$ 3.8
Central Asia	$ 0.6	$ 0.7	$ 0.8	$ 0.9	$ 0.8	$ 0.9	$ 0.9	$ 1.0	$ 1.0	$ 1.1	$ 1.1
Total	$19.8	$26.5	$29.3	$33.1	$25.3	$28.9	$32.2	$33.9	$35.8	$37.8	$39.8

Source: Spears and Associates

Mud Engineering

It is estimated that the global mud engineering market totaled $1.3 billion in 2009, of which North America was the largest regional market (30%), followed by China (18%), and Russia (16%).

5 Throughout This report the following regions have been defined as follows: Central Asia—Azerbaijan, Kazakhstan, Turkmenistan, Uzbekistan, and Ukraine; Mid East—Iran, Iraq, Israel, Kuwait, Oman, Qatar, Saudi Arabia, Syria, Turkey, UAE, and Yemen; Far East—Australia, India, Indonesia, Japan, Malaysia, Myanmar, New Zealand, Pakistan, Papua New Guinea, Thailand, and Vietnam. Also, China includes Hong Kong.

The global mud engineering market is projected to increase at an 8.2% CAGR over the 2009 to 2015 timeframe, reaching $2.1 billion in 2015.

Mud Engineering Services Market ($ Billion)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	$0.21	$0.24	$0.25	$0.24	$0.23	$0.24	$0.25	$0.26	$0.27	$0.28	$0.29
North America	$0.54	$0.63	$0.62	$0.66	$0.39	$0.55	$0.65	$0.68	$0.72	$0.76	$0.80
South America	$0.13	$0.13	$0.14	$0.15	$0.14	$0.15	$0.17	$0.18	$0.19	$0.20	$0.22
Europe	$0.03	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.05	$0.05	$0.05
Africa	$0.04	$0.04	$0.05	$0.05	$0.04	$0.06	$0.06	$0.07	$0.07	$0.08	$0.08
Mid East	$0.08	$0.07	$0.08	$0.08	$0.07	$0.08	$0.08	$0.09	$0.09	$0.10	$0.10
Far East	$0.10	$0.10	$0.11	$0.11	$0.10	$0.11	$0.12	$0.13	$0.13	$0.14	$0.15
Russia	$0.12	$0.15	$0.18	$0.20	$0.21	$0.22	$0.24	$0.25	$0.27	$0.28	$0.29
Central Asia	$0.05	$0.05	$0.07	$0.08	$0.07	$0.08	$0.08	$0.09	$0.09	$0.10	$0.10
Total	$1.30	$1.45	$1.52	$1.63	$1.30	$1.53	$1.69	$1.78	$1.88	$1.98	$2.09

Source: Spears and Associates

Cementing Services

It is estimated that the global cementing services market totaled $7.7 billion in 2009, of which North America was the largest regional market (38%), followed by South America (14%), China (12%), and Russia (11%).

The global mud engineering market is projected to increase at an 9.8% CAGR over the 2009 to 2015 timeframe, reaching $13.4 billion in 2015.

Cementing Services Market ($ Billion)

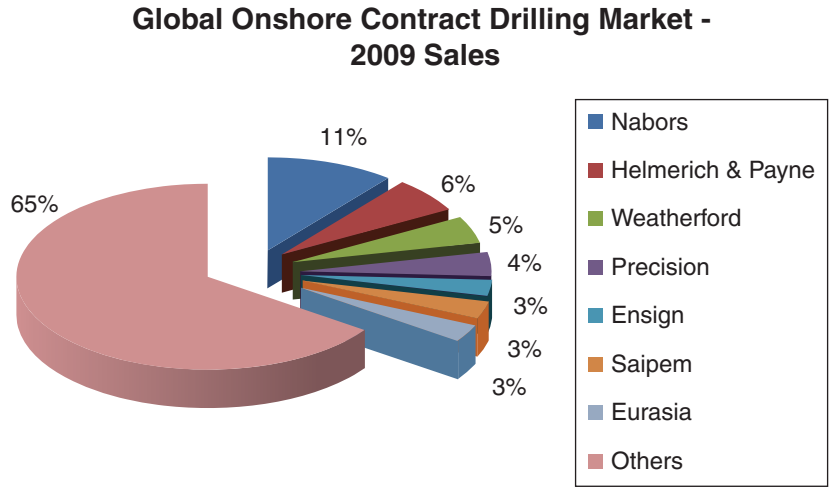
Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	$1.3	$1.3	$1.3	$ 1.5	$1.3	$1.3	$ 1.3	$ 1.4	$ 1.5	$ 1.5	$ 1.6
North America	$5.4	$5.9	$5.8	$ 6.3	$4.0	$5.7	$ 6.7	$ 7.1	$ 7.5	$ 7.9	$ 8.3
South America	$0.5	$0.5	$0.6	$ 0.6	$0.6	$0.6	$ 0.7	$ 0.7	$ 0.8	$ 0.8	$ 0.9
Europe	$0.2	$0.2	$0.2	$ 0.2	$0.2	$0.2	$ 0.2	$ 0.2	$ 0.2	$ 0.3	$ 0.3
Africa	$0.2	$0.2	$0.3	$ 0.3	$0.3	$0.3	$ 0.3	$ 0.4	$ 0.4	$ 0.4	$ 0.4
Mid East	$0.2	$0.2	$0.3	$ 0.3	$0.2	$0.3	$ 0.3	$ 0.3	$ 0.3	$ 0.3	$ 0.3
Far East	$0.4	$0.5	$0.5	$ 0.5	$0.5	$0.5	$ 0.5	$ 0.6	$ 0.6	$ 0.6	$ 0.7
Russia	$0.3	$0.4	$0.5	$ 0.5	$0.6	$0.6	$ 0.6	$ 0.7	$ 0.7	$ 0.7	$ 0.8
Central Asia	$0.1	$0.1	$0.1	$ 0.1	$0.1	$0.1	$ 0.1	$ 0.1	$ 0.1	$ 0.1	$ 0.1
Total	$8.6	$9.4	$9.5	$10.3	$7.7	$9.6	$10.8	$11.4	$12.0	$12.7	$13.4

Source: Spears and Associates

Main Service Providers and Market Share

Onshore Contract Drilling

There are an estimated 500 drilling contractors (70% in North America, 30% outside North America) serving the $25.3 billion global onshore contract drilling market. In terms of sales the market is dominated by North America-based multinational firms such as Nabors Industries, Helmerich & Payne, and Weatherford.



Source: Spears and Associates

The following is a profile of the leading onshore contract drilling companies:

Nabors Industries—A publicly-traded diversified oilfield services company. Its onshore drilling rig fleet operates in the following regions: North America, South America, Africa, the Mid East, and the Far East. It also operates offshore platform drilling rigs.

Helmerich & Payne—A publicly-traded drilling contractor with onshore drilling operations in North and South America and offshore platform drilling rigs.

Weatherford—A publicly-traded diversified oilfield services company. Its onshore drilling rig fleet operates in the following regions: South America, Africa, the Mid East, and the Far East.

Precision Drilling—A publicly-traded diversified oil services company. Its onshore drilling rig fleet operates in North America and South America.

Ensign Drilling—A publicly-traded drilling contractor. Its onshore drilling rig fleet operates in North America and South America.

Saipem—A publicly-traded diversified oilfield service firm. Its onshore drilling rig fleet operates in the following regions: South America, Europe, Africa, and the Mid East.

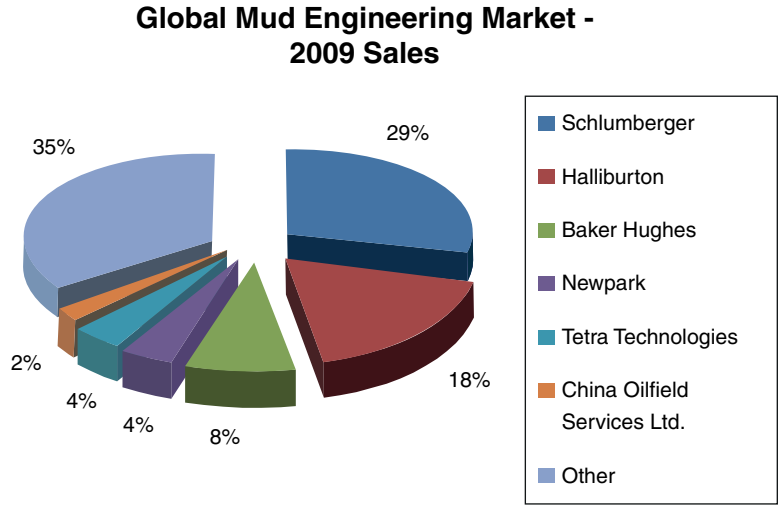
Eurasia Drilling—A diversified oilfield service firm primarily serving the Russian market. It currently captures about 25% of the Russian drilling market.

San Antonio—A privately-held diversified oilfield service firm. Its onshore drilling rig fleet operates in South America.

Great Wall Drilling—a division of China National Petroleum Company (CNPC) which provides onshore contract drilling and other drilling-related services. It operates in China, Africa, the Mid East, Central Asia, and South America.

Mud Engineering

In terms of revenues the $1.3 billion global mud engineering market is dominated by North America-based multinational firms such as M-I Swaco (a division of Schlumberger), Baroid (a division of Halliburton), and Inteq (a division of Baker Hughes International).



Source: Spears and Associates

The following is a profile of the leading mud engineering companies:

M-I Swaco—A division of Smith International, which was recently purchased (2010) by Schlumberger, a publicly-traded diversified oil services company.

Halliburton—A publicly-traded diversified oil services company. Its Baroid division provides both drilling fluids and mud engineering services to a global clientele.

Baker Hughes—A publicly-traded diversified oil services company. Its Inteq division provides both drilling fluids and mud engineering services to a global clientele.

Newpark Resources—a publicly traded diversified oil services company. It provides drilling fluids and mud engineering services primarily in North America.

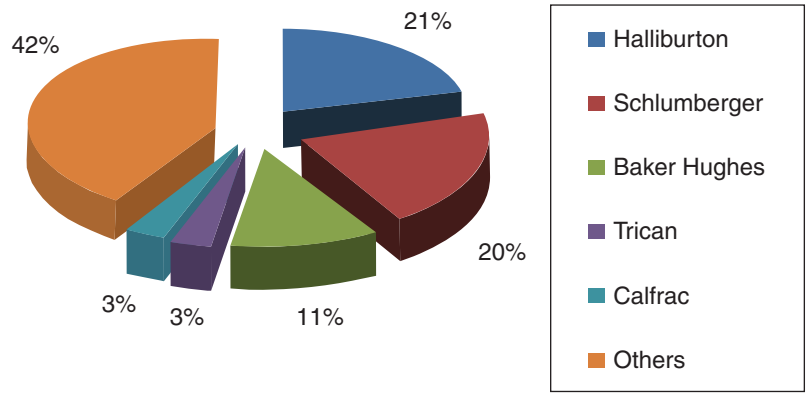
Tetra Technologies—a publicly traded diversified oil services company. It provides drilling fluids and mud engineering services primarily in North America.

China Oilfield Services Ltd.—a publicly traded diversified oil services company. It is based in China but provides drilling fluids and mud engineering services primarily in the offshore China market, the Mid East, Africa, the Far East, Central Asia, and South America.

Cementing Services

In terms of revenues the $7.7 billion global cementing services market is dominated by North America-based multinational firms such as Halliburton, Schlumberger, and BJ Services (a division of Baker Hughes International).

Global Cementing Services Market - 2009 Sales



Source: Spears and Associates

The following is a profile of the leading cementing services companies:

Halliburton—A publicly-traded diversified oil service company that provides cementing services around the world.

Schlumberger—A publicly-traded diversified oil service company that provides cementing services around the world.

Baker Hughes—A publicly-traded diversified oil service company that through its recent acquisition of BJ Services also has a presence in the global cementing services market, but with a heavy concentration in the US, Canadian and Mexican markets.

Competitive Environment

In all markets the selection of a drilling services firm (drilling contractor, mud engineering firm, cementing service company) is typically made by the oil company's drilling department and procurement department following a competitive bid process. The most important selection criteria is typically price, although other factors do come into play including type of well, past experience/reputation, technical sophistication, condition of equipment, and experience of personnel.

Barriers to entering the drilling services market can be very high. The drilling services market is capital intensive and requires both well-maintained equipment and experienced personnel in order to be competitive. In addition, it takes time for drilling services firms to establish a proven track record in order to find wide acceptance in the market. Developing proprietary technology is often critical in order to be able to compete for high-risk "critical service" assignments.

In China demand for drilling services is highly concentrated: two operators (CNPC and Sinopec) account for approximately 90% of the demand for drilling services. Both CNPC and Sinopec have regional in-house drilling services subsidiaries which tend to compete on price on low-risk projects for their parent company. The in-house

drilling service subsidiaries of CNPC and Sinopec are estimated to capture 80%-90% of the drilling services market in China. In addition, more than 20 independent Chinese-owned drilling service firms are estimated to compete in the Chinese market, along with the China-based subsidiaries of multinational oilfield drilling services firms such as Schlumberger, Halliburton, and Baker Hughes. When drilling services are needed, the purchasing department of the oil company will solicit bids from multiple sources on the approved vendors list. The selection of a drilling services firm is typically made by the oil company's drilling department and procurement department following a competitive bid process. Drilling services may be sold under an annual contract or on a well-to-well basis.

In terms of demand, the Russian drilling services market is not as highly concentrated as China. The larger Russia oil companies often have in-house regional drilling services subsidiaries which tend to compete on price on low-risk projects for their parent company. These in-house drilling service subsidiaries are believed to capture the majority of the drilling services market in Russia. When drilling services are needed, the purchasing department of the oil company will solicit bids from multiple sources on the approved vendors list. The selection of a drilling services firm is typically made by the oil company's drilling department and procurement department following a competitive bid process. Drilling services may be sold under an annual contract or on a well-to-well basis.

In terms of demand, the drilling services market outside China and Russia is divided among thousands of end-users, the largest of which is estimated to account for no more than 5% of the overall market. Most customers are oil companies, although the drilling contractor may sometimes be the customer, as in the case of some offshore drilling being done in the Gulf of Mexico on a turnkey basis where the contractor acts as the drilling manager. Market penetration requires significantly more marketing and sales resources than is the case in China and Russia. Outside of China and Russia no one service firm dominates the drilling services market. In most markets competitors include: (1) large multinational oilfield service firms with significant financial and technical resources focused primarily on high-risk "critical service" projects, and (2) local or regional firms with detailed knowledge about local surface or downhole drilling conditions which allows them to more precisely estimate operating time/costs and thus underbid competitors that have less local knowledge. In some countries the in-house drilling service subsidiary of the national oil company is yet another competitor. The selection of a drilling services firm is typically made by the oil company's drilling department and procurement department following a competitive bid process. Drilling services may be sold under an annual contract or on a well-to-well basis.

Purchasing Process

Onshore Contract Drilling

The selection of a drilling contractor is typically made by the oil company's drilling engineer following a competitive bid process. The most important selection criteria is typically price, although other factors do come into play including past experience/reputation, condition of equipment, and experience of personnel. Local or regional firms are often able to compete with national or international contractors because their detailed knowledge about local downhole drilling conditions allows them to more precisely estimate drilling time and thus underbid larger competitors that are more remotely located.

Mud Engineering

Operators are the primary customers of mud companies. However, the drilling contractor may sometimes be the customer, as in the case of some offshore drilling being done in the Gulf of Mexico on a turnkey basis where the contractor acts as the drilling manager.

Since operators generally perceive drilling fluids as commodity items, the key selection factors are price and service/support. The price of drilling fluids is usually evaluated in terms of $/well or $/foot, taking into account performance of the fluid as well as unit price.

Drilling fluids may be sold under an annual contract or on a well-to-well basis. Pricing is typically quoted as a percent off list for each product covered under the contract.

Major service companies dominate the drilling fluids market in areas that require high-technology applications (deep, high-pressure, offshore, etc.).

Cementing Services

Cementing services are sold to whoever is in charge of drilling a well. This is most often the oil company, but in the North American market when a well is being drilled under a turnkey contract it is the drilling contractor. When an oil company selects the cementing service firm the drilling engineer holds the key buying influence. Most cementing service firms work under well-to-well contractors for small and mid-size oil companies, but in North America cementing service firms work under one-year contractors and outside North America most cementing service firms work under long-term (up to three year) contracts.

Service, availability, reliability, and price are typically the key factors in the selection of a cementing service company.

Breakdown of the Cost to Drill a Well

Payments to the drilling contractor (for drilling rig mobilization/de-mobilization, drilling rig use, labor, fuel, etc.) typically account for 25%-35% of the total cost to drill a new onshore well. Casing and tubing used to line the wellbore is typically the second largest cost element of a newly-drilled onshore well, typically accounting for 15%-20% of the total cost of the well. The balance of the total well cost is associated with the use of a broad range of downhole products and services—drill bits, drilling fluid, logging services, supervision, completion equipment, cementing services, etc.

Synergies Between Drilling Service and Manufacturer of Drill Pipe and Coating Service Provider

A contract drilling firm which also makes drill pipe potentially has a cost advantage over other contract drilling firms which must source their drilling equipment from third parties at market prices. For example, at present the cost of a fully-equipped new western-built onshore drilling rig rated to drill 5,000 meters is estimated to be $25-$30 million[6]. It is estimated that for most drilling contractors about 25%-30% of their total capital outlay is spent on purchasing drill pipe. As a result, savings of the cost of procuring drill pipe by producing it in-house would allow an onshore drilling contractor to charge lower rig rates, providing an advantage when competing for work for price-conscious oil and gas companies.

Another potential advantage of a contract drilling firm that makes drill pipe is that it may be able to leverage proprietary information (acquired through drill pipe research and development) in such as way as to achieve superior drilling performance.

Vertical synergies

In line with Hilong's strategy of vertically integrating drill pipe manufacturing/coating and contract drilling, there are several examples of other oilfield service firms that have vertically integrated in order to achieve superior performance. As a rule, these instances occur in key technology areas where the oilfield service firm has made significant R&D efforts that can provide important performance and cost advantages. Some examples include:

Nabors Industries, the largest onshore contract drilling company, which also owns rig data acquisition and information management products and services.

Halliburton, the largest pressure pumping services company, which manufactures its own cementing and stimulation equipment.

6 Chinese-built drilling rig costs are estimated to be 25%-30% less than that of western-built drilling rigs.

Schlumberger, Halliburton, and Baker Hughes, the leading directional drilling service companies, which manufacture their own directional drilling tools.

Pricing Trends and Expectations

Onshore Contract Drilling

Average US land rig rates in Q2 2010 were about $19,500 per day, up 4% from the previous quarter but 3% lower than the year-ago level. We expect that US land rig rates will move higher through year-end and average around $19,750 per day in 2010, down about 3% for the year. With US rig count trending higher, we believe that average rig rates will increase 5%-8% in 2011; however, continued low overall fleet utilization is likely to cap additional gains over the near term.

Beyond 2011 we expect that US land rig day rates will increase at an average annual rate of 3%; future additions to the US rig fleet are expected to offset further improvements in rig activity, leaving overall rig fleet utilization near current levels.

Canadian drilling contractors reported that their land rig rates in Q2 2010 averaged C$16,300 per day, up 5% from the prior quarter but down 10% from Q2 2009. We expect that Canadian land rig rates will average C$16,000 in 2010, down about 10% for the year. However, the upturn expected in Canadian drilling activity will somewhat improve rig utilization and may prompt a slight increase in rig rates in the coming year.

Going forward we expect that Canadian land rig day rates will increase at an average annual rate of 3%; while no future additions to the Canadian rig fleet are expected over the forecast timeframe, the low utilization of the Canadian rig fleet is not expected to improve sufficiently to allow drilling contractors to increase prices faster than the overall rate of inflation.

International land rig day rates averaged about $30,400 per day in Q2 2010, down 3% from the prior quarter and down about 13% from Q2 2009. We estimate that International land rig rates will average around $30,000 per day in 2010, down from about $35,000 per day last year; as shown by the following chart, the overall trend in average International land rig rates has generally been flat for the first two quarters of this year.

Going forward we expect that international land rig day rates will increase at an average annual rate of 3%; future additions to the rig fleet are expected to offset further improvements in rig activity, leaving overall rig fleet utilization near current levels.

Cementing Services

The cost of cementing services is not tracked outside the US. In the US the cost of cementing services is tracked in the Spears and Associates Drilling and Completion Services (DCS) Cost Index. The DCS Cost Index Cementing Services Cost series for Q3 2010 rose 5.3% from the prior quarter. This represents the first increase in cementing service costs since prices stabilized in Q3 2009. Going forward we expect that cementing service costs in the US will rise at an average annual rate of 3%; further improvements in rig activity that are forecast are expected to be insufficient to lift equipment utilization high enough to allow cementing service firms an opportunity to push prices significantly higher.

GLOBAL DRILL PIPE MARKET

Description

The drill pipe market as addressed in this study includes the sale of drill pipe, drill collars, and heavy weight drill pipe. It excludes the sale of non-magnetic drill collars. The market for welding wires for hardbanding is treated separately.

Drill pipe is used during drilling operations to connect the surface drilling equipment to the bottomhole assembly and the drill bit, and is used to transmit power from the drilling motor above ground to the drill bit and to conduct drilling fluid (mud) down to the drill bit to flush drill cuttings to the surface for removal. A section of drill pipe is called a "joint"; each joint is normally about thirty feet long with an outer diameter (OD) ranging from 2.375 to 6.625 inches, are joined to one another by tool joints to form the drill string. Drill pipe can also be produced to approximately forty feet (Range 3) lengths depending upon customer drilling rig requirements.

Drill pipe normally must have sufficient tensile strength to support its own weight, the weight of the contained drilling fluids, and the drill bit. Drill pipe is subject to stress caused by shearing vibration, and consequently fatigue. Normally a drill string is composed of drill collars at the bottom, which are connected to heavy weight drill pipe, which are then connected to standard weight drill pipe, which normally accounts for the vast majority of the drill string. The standard weight drill pipe, heavy weight drill pipe, and drill collars all normally perform the same purposes; they just vary by wall thickness and can also vary by production methods.

Both ends of each joint are threaded, with one end having the threads cut inside the pipe (the box), and the other end threaded on the outside (the pin). These ends are called tool joints, and are usually welded onto the drill pipe body (the mother tube) by a manufacturer with the threads cut to industry specifications. Drill pipe is usually formed from plain carbon steel. A drill string is the combination of the drill pipe, the bottomhole assembly, and the drill bit used to drill a well. Drill pipe is typically owned by the drilling contractor, although sometimes it is rented by the well operator from downhole tool rental companies for use in drilling a well or series of wells.

Drill collars are a part of the drill string that provides weight on bit for drilling. Drill collars are thick-walled tubes machined from solid bars of steel, usually plain carbon steel. The bars of steel are drilled from end to end to provide a passage to pumping drilling fluids through the collars. The outside diameter of the steel bars may be machined slightly to ensure roundness, and in some cases may be machined with helical grooves. Threaded connections are cut so multiple collars can be screwed together along with other downhole tools to make a bottomhole assembly. Drill collars are typically rented by the well operator from downhole tool rental companies for use in drilling a well or series of wells, although sometime drill collars are provided by the drilling contractor.

Heavy weight drill pipe (HWDP) is a type of drill pipe whose walls are thicker and collars are longer than conventional drill pipe. HWDP tends to be stronger and has higher tensile strength than conventional drill pipe, so it is placed near the bottom of a long drill string for additional support.

Manufacturing Process

Drill Pipe

Most specialized drill pipe manufacturers are semi-fabricators, purchasing green tubes from a mill, then heat treating the tube to specific metallurgical requirements, adding tool joints, and cutting threads to complete the manufacturing process. The price of finished drill pipe to the end user is about 3.5x-4.0x the cost of the mother tube from the mill.

Finished drill pipe is comprised of two components: (1) the pipe or tube component, and (2) the tool joint component. The majority of producers of finished drill pipe manufacture the product by purchasing the tube component of the finished drill pipe separate from the tool joint component, and then assembling the two together.

Drill pipe is first manufactured by seamless tube mills, and then further processed by finishing manufacturers. The producers of finished drill pipe are normally different than the producers of green tube used for producing drill pipe. Green tube, or semi-finished drill pipe, is manufactured at a seamless tube mill by either of two high temperature methods to form a central cavity in the solid steel billet, namely, the rotary piercing method and the hot extrusion method. Starting material for green tube is a round or square steel billet. If square billet is used, it is first forced through a single circular roll pass, producing a round billet for the piercing operation.

In the rotary piercing method, the heated billet is gripped by angled rolls, which cause it to rotate and advance over a piercer point, forming a hole through its length.

In the extrusion method, the billet is hot punch pierced and then extruded axially through a dye and over a mandrill, forming a hollow shell.

The hollow shell produced by either method is then rolled with either a fixed plug or a continuous mandrill inside the shell to reduce the wall thickness, increasing the length. Finally, the shell is rolled in the sizing mill or a stretch reducing mill is formed to size.

Drill collars begin with a round steel bar which is then bored or trepanned in order to form a continuous seamless product.

Drill pipe manufacturers purchase unfinished green pipe to certain steel chemistries that allow the drill pipe processor to produce the appropriate API grade of drill pipe. The pipe ends on the green tubes are first processed by heating the ends of the pipe to forging temperature and then quickly inserting the pipe ends into a special forging press or upsetter. The press will form a pipe upset that is thicker than the pipe wall by pressing the hot metal around a set of special forging dies. Dimensional tolerances are required for the various pipe sizes and upset configurations, all of which are controlled by API dimensional tolerances. The upset pipe is then heat treated by any of several methods of thermal processes to the desired API grade, with the drill pipe processor using a specific green tube chemistries to produce the final API drill pipe grade, depending upon their thermal treatment process.

A tool joint is then welded to each end of the pipe; the male tool joint section (or pin) with male threads on the outside of the pipe, is attached to one end of the length of drill pipe and the female tool joint section (or box) with female threads on the inside, is attached to the other end.

A tool joint is a heavy coupling element made of special-alloy steel having robust, tapered threads and seating shoulders designed to sustain the weight of the drill stem, withstand the strain of repeated connection and disconnection, and provide a leak-proof seal.

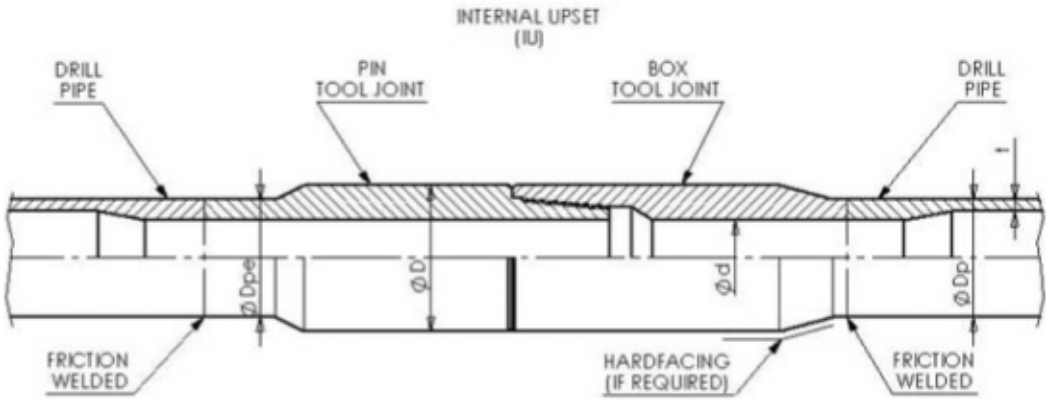


Figure 2: Drill Pipe with Weld-On Tool Joint Assembly[7]

7 Source: Bellino

The tool joint is welded onto the drill pipe during finishing operations; this welding is done by rotational friction. The heat for the weld is created by pressuring one piece of metal against another piece which is rotated at high speed. No filler is used. Tool joints may be welded to the pipe, screwed onto the pipe, or a combination of screwed on and welded. Most commonly, tool joints are permanently welded to the pipe.

A section of drill pipe is called a "joint"; each joint is normally about thirty feet long with an outer diameter (OD) ranging from 2.375 to 6.625 inches. Drill pipe can also be produced to approximately forty feet (Range 3) lengths depending upon customer drilling rig requirements.

Drill pipe is normally produced to conform to American Petroleum Institute (API) specification 5D, 5DP or BSEN ISO 11961. Heavy weight drill pipe and drill collar are normally produced to conform to API specification 7. Other non-API or ISO specifications include NS 1 (originally developed by Shell Oil) and IRP (originally developed by the Canadian Government for sour service applications). Many producers have proprietary grades that meet or exceed API specifications. For example, VAM Drilling offers VAM EIS and VAM Express pipe that feature high-torque connections, while Grant Prideco offers TSS-95 and XD-l 05 proprietary grades for sour service and extreme drilling applications.

The key technical barriers to entry in the drill pipe market are the expertise in chemistry, heat treatment, and manufacturing processes that are required to produce a high-quality product.

Drill Pipe Market Outlook

It is estimated that the global drill pipe market totaled 17.2 million feet and $647 million in 2009, of which North America was the largest regional market in terms of sales (46%), followed by China (24%), Russia (7%), and South America (9%).

The global drill pipe market is projected to increase at a 13.3% CAGR over the 2009 to 2015 timeframe, reaching $1.4 billion in 2015.

Drill Pipe Market ($ Million)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	$153	$161	$164	$ 209	$154	$157	$167	$ 177	$ 188	$ 199	$ 211
North America	$396	$439	$432	$ 563	$295	$425	$507	$ 544	$ 587	$ 633	$ 679
South America	$ 45	$ 48	$ 52	$ 66	$ 55	$ 58	$ 64	$ 69	$ 75	$ 81	$ 88
Europe	$ 12	$ 12	$ 13	$ 15	$ 12	$ 13	$ 14	$ 15	$ 16	$ 17	$ 18
Africa	$ 14	$ 18	$ 20	$ 25	$ 20	$ 24	$ 26	$ 28	$ 31	$ 34	$ 37
Mid East	$ 22	$ 23	$ 26	$ 31	$ 24	$ 25	$ 27	$ 29	$ 31	$ 33	$ 35
Far East	$ 30	$ 31	$ 31	$ 37	$ 32	$ 34	$ 37	$ 40	$ 44	$ 47	$ 51
Russia	$ 82	$102	$121	$ 165	$ 45	$ 69	$112	$ 176	$ 189	$ 202	$ 216
Central Asia	$ 15	$ 20	$ 21	$ 27	$ 10	$ 13	$ 18	$ 26	$ 28	$ 30	$ 32
Total	$769	$855	$881	$1,138	$647	$818	$973	$1,105	$1,188	$1,276	$1,368

Source: Spears and Associates

Although new rig construction generates demand for drill pipe, about 80% of the demand for new drill pipe is associated with replacing existing drill pipe. On average, it is estimated that about 20%-30% of a drill string is replaced each year due to normal wear and tear. However, it is estimated that routine maintenance accounts for only about half of total drill pipe replacement demand, with the rest associated with drill pipe that is lost downhole.

Drill Pipe Market (Million Ft)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	5.1	5.4	5.5	5.8	5.1	5.2	5.3	5.4	5.4	5.5	5.5
North America	9.9	11.0	10.8	11.8	7.4	10.6	12.1	12.3	12.7	13.0	13.3
South America	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.4
Europe	0.2	0.2	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Africa	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6
Mid East	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6
Far East	0.6	0.6	0.6	0.7	0.6	0.7	0.7	0.7	0.8	0.8	0.8
Russia	2.7	3.4	4.0	4.6	1.5	2.3	3.6	5.3	5.4	5.5	5.7
Central Asia	0.5	0.7	0.7	0.8	0.3	0.4	0.6	0.8	0.8	0.8	0.8
Total	20.7	23.1	23.9	26.0	17.2	21.7	24.7	27.1	27.7	28.3	28.9

Source: Spears and Associates

Drilling contractors almost exclusively use drill pipe that meets or exceeds API (American Petroleum Institute) specifications. Globally, 135 facilities can meet the API-5DP specification for drill pipe.

Drill Pipe Market (000 Tons)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	42	45	45	48	43	44	44	44	45	45	46
North America	82	91	90	98	61	88	100	102	105	108	110
South America	7	8	9	9	9	10	10	10	11	11	11
Europe	2	2	2	2	2	2	2	2	2	2	2
Africa	2	3	3	4	3	4	4	4	4	5	5
Mid East	4	4	4	4	4	4	4	4	4	5	5
Far East	5	5	5	6	5	6	6	6	6	6	7
Russia	23	28	33	38	12	19	30	44	45	46	47
Central Asia	4	6	6	6	3	4	5	6	7	7	7
Total	172	191	198	216	143	180	205	225	230	235	240

Source: Spears and Associates

Pricing Trends and Expectations

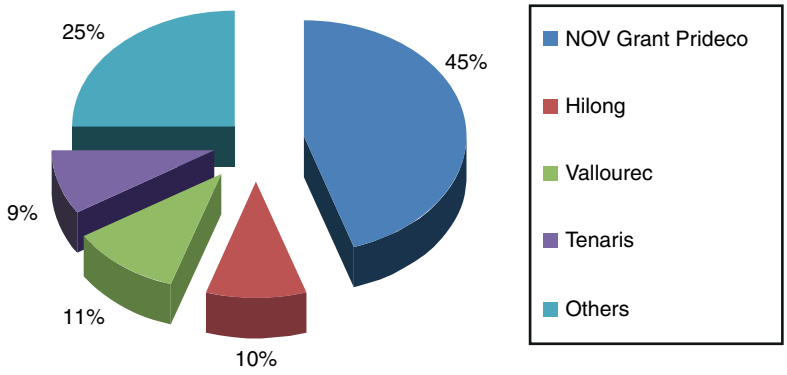
Depending on the grade, drill pipe is currently selling for $3,000 to $6,000 a short ton. Over the past year drill pipe prices have rebounded from their 2009 lows and are currently selling near the 2006-2007 level.

Going forward drill pipe prices are expected to rise about 5% per year; forecast increases in drilling activity are expected to be insufficient to lift drill pipe manufacturing capacity utilization high enough to allow drill pipe suppliers an opportunity to push prices significantly higher than 5% per year.

Main Manufacturers

In terms of revenues the global market for drill pipe, drill collars, and heavy-weight drill pipe is estimated to have totaled $881 million in 2007. NOV Grant Prideco is estimated to have captured 45% of the global market in 2007, followed by Vallourec (11%), the Hilong Group (10%), and Tenaris (9%).

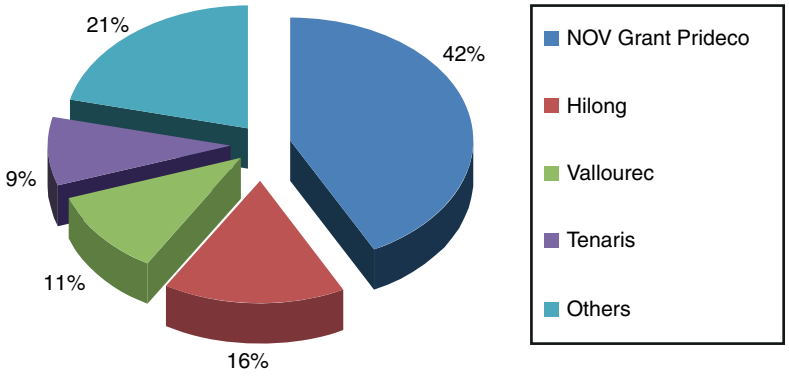
Global Drill Pipe Market - 2007 Sales



Source: Spears and Associates

In terms of revenues the global market for drill pipe, drill collars, and heavy-weight drill pipe is estimated to have totaled $1,138 million in 2008. NOV Grant Prideco is estimated to have captured 42% of the global market in 2008, followed by the Hilong Group (16%), Vallourec (11%), and Tenaris (9%).

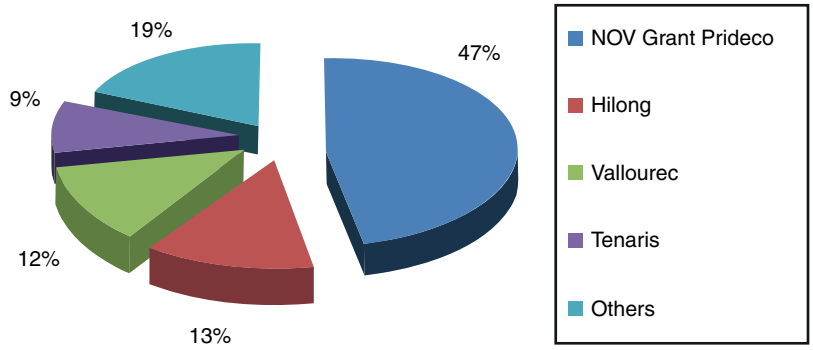
Global Drill Pipe Market - 2008 Sales



Source: Spears and Associates

In terms of sales the $647 million global market for drill pipe, drill collars, and heavy-weight drill pipe in 2009 was dominated by NOV Grant Prideco, the Hilong Group, Vallourec, and Tenaris, which combined to capture an estimated 81% of the global market in 2009.

Global Drill Pipe Market - 2009 Sales



Source: Spears and Associates

The Chinese drill pipe market is led by Hilong; in terms of sales it is estimated to have held about 30% of this market over the 2007 to 2009 timeframe on the strength of its position as the leading drill pipe supplier to both CNPC and Sinopec, the two largest operators in China which are estimated to combine to account for over 90% of the Chinese drill pipe market. Other significant suppliers to the Chinese drill pipe market include Grant Prideco (with approximately 20% of the market), and DP Master and Long Bright (each with an estimated 10%-15% of the market). The balance of the Chinese drill pipe market is believed to be divided among 15-20 other firms.

The North American market is dominated by Grant Prideco, which is estimated to capture 70%-75% of this market, Vallourec (10%-15%), and Tenaris (10%). Other suppliers are estimated to hold around 10% of the North American drill pipe market.

At present access to the North American and European markets by Chinese drill pipe suppliers is restricted because of high tariffs.

Outside of North America, and excluding Russia and China, the drill pipe market is led by Grant Prideco (with an estimated 35%-40% of the market), Tenaris (30%-35%), and Vallourec (20%-25%). Other suppliers, mostly Chinese pipe companies, are estimated to capture 10%- 15% of this market. One non-Chinese drill pipe supplier in the "Other" category in this market is Oil Country Tubular Ltd., of India.

Russian pipe manufacturers are estimated to capture about 30% of the Russian drill pipe market, while importers (primarily Chinese) hold an estimated 70% of the Russian market. Hilong is estimated to be the leading foreign supplier to the Russian market, with an estimated 20% share of the market. In Russia—unlike other markets—aluminum drill pipe has often been used in place of conventional steel drill pipe to drill deviated wells, in part because of its superior fatigue resistant but also due the benefit of its lower weight than conventional steel pipe which was an important factor due to limitations on the hoisting capacity of drilling rigs built during the Soviet era. Very little Russian-made drill pipe tends to be exported.

The following is a profile of the leading global drill pipe suppliers:

Hilong is a diversified oilfield manufacturing supplying drill pipe, drill collar, heavy-weight drill pipe, sour service drilling tools, seamless pipe, OCTG, line pipe, hardbanding material, precision instrument and petroleum exploitation equipments both in China and abroad. It reports the following production capacity: Drill Pipe & Heavy Weight Drill Pipe 60,000 tons/year; Drill Collar & Other Drilling Tools 8,000 tons/year;

Drill Pipe Hardbanding 45,000 tons/year; Internal Coatings for Drill Pipe & OCTG 4,800,000 m/year; Special Coating Materials for OCTG 16,000 tons/year; Line Pipe Anti-corrosion 1,800,000 square m/year; OCTG & Special Steel Billets 80,000 tons/year; Line Pipe 150,000 tons/year; and Special Steel Products 10,000 tons/year.

Grant Prideco is a division of National Oilwell Varco (NOV), a publicly-traded US-based oilfield equipment manufacturer. It has pipe plants in North America, Europe, and Asia and is estimated to have 18 million feet per year of drill pipe production capacity. Grant Prideco imports the green tubes it uses in its North American drill pipe production facility from Voest-Alpine, an Austrian steel mill. In China Grant Prideco has a drill pipe manufacturing plant in Tianjin, and another in Jiangsu that makes drill stem products. NOV has a joint venture with the Huabei Petroleum Administration Bureau to coat drill pipe.

Vallourec & Mannesmann is part of Vallourec Group, a publicly-traded European-based steel company. VAM Drilling provides a complete line of drill string products, including a full range of jointed drill pipes in nominal sizes from 2-3/8" to 6-5/8" and in a wide range of wall thicknesses through its IDPA and OMSCO brands. It also manufactures heavy weight drill pipe, drill collars and develops unique tubular solutions and services to improve drilling efficiency.

Tenaris is a publicly-traded Argentina-based steel company. Its pipe division manufactures a complete line of line pipe and OCTG. Drill pipe is available with outside diameters ranging from 2 3/8" to 5 7/8".

Competitive Environment

In all markets the demand for drill pipe is driven by the construction of new drilling rigs and the replacement of worn-out pipe from existing rigs. Pipe replacement is a much larger component of the market than new rig construction. The replacement of drill pipe, drill collars, and heavy-weight drill pipe is driven by two factors: lost-in-hole (LIH) rates and general life expectancy. Technical obsolescence is not a factor in driving tool replacement for drill pipe.

Since drill pipe is used in "critical service" applications (i.e., harsh, abrasive conditions), in all markets pipe quality is the key factor in vendor selection. While pipe quality is the paramount factor, deliverability, service, and price can also play a role in determining the winning bid.

Several elements enter into the consideration of product quality as it relates to drill pipe: metallurgy, dimensional accuracy, and structural integrity. Of these, metallurgy is the most critical, as it directly impacts the key variables associated with drill pipe performance: strength, fatigue resistance, corrosion resistance, and erosion resistance. As a result, manufacturers try to differentiate themselves by stressing their expertise in chemistry, heat treatment, and manufacturing processes.

The drill pipe market is very capital intensive on both a capital and operating cost basis, and the qualification process to become an approved vendor can be time-consuming and expensive. In addition, the drill pipe manufacturing process requires sophisticated metallurgical skills and experience, with the key technical barriers to entry in the drill pipe market being the expertise in chemistry, heat treatment, and manufacturing processes that are required to produce a high-quality product. As a result, firms entering the drill pipe market must have significant financial and technical resources.

In China demand for drill pipe is highly concentrated: two companies (CNPC and Sinopec) account for approximately 90% of the market for drill pipe. In China the leading drill pipe manufacturer (Hilong) is estimated to hold about 30% of the market; other significant suppliers to the Chinese drill pipe market include Grant Prideco (with approximately 20% of the market), and DP Master and Long Bright (each with an estimated 10%-15% of the market). In all approximately 20 firms are believed to compete in the Chinese drill pipe market. When pipe is needed, the purchasing department of a drilling contractor will solicit bids from multiple sources on the approved vendors list. The selection of a drill pipe supplier is typically made by a contract drilling firm's operations department and procurement department following a competitive bid process.

In terms of demand, the Russian drill pipe market is not as highly concentrated as China. In the Russian market one domestic drill pipe manufacturer (TMK) is estimated to hold about 30% of the market and compete with a number of primarily China-based drill pipe importers. It is primarily the purchasing departments of drilling contractors which determine the source of the drill pipe. When pipe is needed, the purchasing department of a drilling contractor will solicit bids from multiple sources on the approved vendors list. The selection of a drill pipe supplier is typically made by a contract drilling firm's operations department and procurement department following a competitive bid process.

In terms of demand, the drill pipe market outside China and Russia is divided among more than 300 end-users, the largest of which (Nabors Industries) is estimated to account for less than 20% of the overall market. As a result, market penetration requires significantly more marketing and sales resources than is the case in China and Russia. Outside of China and Russia the drill pipe market is dominated by three large multinational suppliers (the Grant Prideco division of NOV, Tenaris, and Vallourec and Mannesman), each with significant financial resources and a long-established track trecord. In markets outside of China and Russia up to four sets of inventories exist for drill pipe, drill collars, and heavy-weight drill pipe: at the pipe manufacturer, in the pipe distributor's yard, at the drilling rig, and in the tool rental company's stocking facility. Therefore a pipe manufacturer can have several different types of customers—drilling contractors, tool rental companies, supply stores and other independent distributors. However, outside China and Russia the primary customers for drill pipe, drill collars, and heavy-weight drill pipe include both drilling contractors and specialty downhole tool rental companies. It is primarily the purchasing departments of drilling contractors and tool rental companies which determine the source of the drill pipe. When pipe is needed, the purchasing department will solicit bids from multiple sources on the approved vendors list.

Type of Products by Competitors

The leading drill pipe manufacturing firms provide a broad line of drilling tubular products, as shown in the following table:

Suppliers by Type of Product

	Drill Pipe							
	API Grades							
Suppliers	E-75	X-95	G-105	S-135	Proprietary Grades	Tool Joints	Drill Collars	Heavy-Weight Drill Pipe
Grant Prideco	X	X	X	X	X	X	X	X
VAM	X	X	X	X	X	X	X	X
Hilong	X	X	X	X	X	X	X	X
Tenaris	X	X	X	X	X	X	X	X
DP Master	X	X	X	X		X	X	X
TMK OAO	X	X	X	X	X	X		

Source: Spears and Associates

The Fearnley Procter NS-1 standard was originally developed by Shell covers products that have been reviewed and qualified by the Fearnley Procter NS-1 Technical Review Committee consisting of industry experts including users, manufacturers and consultants of drilling and well completion equipment. Manufacturers that have achieved the Fearnley Procter NS-1 certification for drill pipe in the PRC consist of: Hilong, DP Master and PetroMaterials. Several others -Grant Prideco (Jiangsu) Drilling Products Company, Tianjin Grant Prideco TPCO Oilfield Drilling Products Company, Bohai NKK Drill Pipe Company—are currently in the process of obtaining their NS-1 certification.

Purchasing Process

Four sets of inventories exist for drill pipe, drill collars, and heavy-weight drill pipe: at the pipe manufacturer, in the pipe distributor's yard, at the drilling rig, and in the tool rental company's stocking facility. Therefore a pipe manufacturer can have several different types of customers—drilling contractors, tool rental companies, supply stores and other independent distributors. The primary customers for drill pipe, drill collars, and heavy-weight drill pipe are drilling contractors and specialty downhole tool rental companies.

It is primarily the purchasing departments of drilling contractors and tool rental companies which determine the source of the drill pipe. When pipe is needed, the purchasing department will solicit bids from multiple sources on the approved vendors list. Since drill pipe is used in "critical service" applications (i.e., harsh, abrasive conditions), pipe quality is the key factor in vendor selection.

Several elements enter into the consideration of product quality as it relates to drill pipe: metallurgy, dimensional accuracy, and structural integrity. Of these, metallurgy is the most critical, as it directly impacts the key variables associated with drill pipe performance: strength, fatigue resistance, corrosion resistance, and erosion resistance. As a result, manufacturers try to differentiate themselves by stressing their expertise in chemistry, heat treatment, and manufacturing processes.

While pipe quality is the paramount factor, deliverability, service, and price can also play a role in determining the winning bid.

The replacement of drill pipe, drill collars, and heavy-weight drill pipe is driven by two factors: lost-in-hole (LIH) rates and general life expectancy. Technical obsolescence is not a factor in driving tool replacement for drill pipe.

R&D and Innovation Trends

New reservoirs are increasingly found a greater depths, or in high temperature or highly corrosive environments. These situations push the design capabilities of products all across the oilfield supply chain, including drill pipe. In recent years drill pipe R&D has focused on materials research to develop (1) lighter-weight pipe for use in drilling ultra-deep (over 5,000 meter) wells, (2) fatigue-resistant pipe for use in drilling horizontal wells, and (3) corrosion-resistant alloys, extreme temperature, and sour service steels for use in "critical service" applications.

Lighter-weight pipe lowers well cost by decreasing the lifting capacity requirements of a drilling rig's pipe-hoisting equipment and in some instances decreasing the load-support requirements for deepwater drilling rigs.

Since oil and gas reservoirs typically have greater horizontal dimensions than vertical dimensions by drilling horizontally a wellbore has increased exposure to the hydrocarbon-bearing formation, resulting in greater well productivity and increased reserves recovery. However, horizontal drilling results in increased wear and tear on the drill string. To that end, researchers have developed graphite fiber-reinforced composites to produce a drill pipe which is lightweight with high fatigue resistance. The technology is suitable for short-radius horizontal drilling and has applications in deep water and extended reach drilling.

The industry's move toward ultra-deep drilling and increased interest in lighter-weight drill pipe has led to increased consideration of non-steel drill pipe. Three types of non-steel materials have been evaluated:

Aluminum drill pipe has several advantages over conventional drill pipe, including lower weight, greater corrosion resistance, greater fatigue resistance, and non-magnetic. However, it costs about twice as much as conventional drill pipe, has low yield strength, and requires greater wall thickness resulting in unacceptable pressure losses.

Composite drill pipe is made by winding carbon fibers over a mandrel while applying an epoxy that encases and seals the fibers. Composite drill pipe is about 3X the cost of conventional drill pipe. Its advantages include: lower weight; higher strength-to-weight ratio; greater corrosion resistance; greater fatigue resistance; and non-magnetic. Its major disadvantage is that it must be thicker than conventional drill pipe in order to achieve the required torsional strength, tensile capacity, and pressure integrity; its greater thickness reduces pipe ID, resulting in unacceptable pressure losses. To-date composite drill pipe has primarily been used in short-radius drilling.

Titanium drill pipe has several advantages over conventional drill pipe: lower weight; higher strength-to-weight ratio; greater corrosion resistance; and greater fatigue resistance. However, it costs 7X-10X more than conventional drill pipe. To-date titanium drill pipe has primarily been used for short-radius drilling.

Along with evaluating non-steel materials, the industry has continued to develop high-strength steels to address the trend toward lighter materials needed for deeper drilling. Most of the research has been to increase the toughness/ductility of high-strength steel grades such as Z-140, V-150, and UD-165 so that they match that of conventional steel grades such as S-135 and G-105. The increased cost of high-strength steels compared to standard drill pipe steel grades is modest.

Hardbanding Market

Hardbanding is a key component in drill pipe manufacturing. Hardbanding increases tool joint life by enabling the drill pipe to resist abrasion from the walls of the borehole. Hardbanding is applied to the tool joint prior to the joint being welded to the pipe body. A hard-metal facing (i.e., hardband) is applied in a band around the outside of the tool joint and on the center wear pad. It is applied under very closely controlled conditions resulting in uniform, wear-resistant surface. It can be flushed, raised, and with a machined finish. This heavy-duty hardmetal application is a closely controlled welding process applied with an automatic hardbanding machine. Hardbanding is generally applied on the box tool joint, on the pin tool joint, on 18 tapered shoulder of box tool joint and on the center upset.

Hardbanding was introduced into the oilfield in the 1930s by Hughes Tool Company. At that time, and for many years afterwards, there was only "tungsten carbide" hardbanding. It consisted of a solid, soft steel wire being welded onto the box tool joint of drill pipe while simultaneously dropping tungsten carbide particles into the molten weld puddle. When it solidified, it left a raised, extremely hard surface above the tool joint that would significantly increase the life of the drill pipe. However, tungsten carbide hardbanding causes wear on casing, increasing the risk of blowouts.

Starting in about 2000, casing-friendly hardbandings, rather than tungsten carbide, have become the norm. "Casing friendly hardbanding" tend to protect the casing more than the drill string. They exhibit a low coefficient of friction that creates less friction during contact with other steel surfaces, resulting in less heat and less wear. One of the first successful materials to come out was a high chrome composition that performed well in the casing protection phase. However, it had a short open-hole wear life and consequently wore the drill pipe tool joints below minimum dimensions within a short time frame. Over the last 15 years, many new hardbanding wires have been developed, but only a select few actually protect the drill pipe, the casing, the blowout preventors and the marine riser pipe at the same time. Most protect one area or another, but not at the same time. Other benefits can be equally important such as significantly reducing the drag and torque created by the drill string while drilling and tripping in the hole.

Almost all competitive hardbanding products in the industry are applied using a MIG welding process, typically at a pipe inspection facility. Mobile units may also be used that can travel to, or near a drilling site. An "applicator" is a modified MIG welding apparatus configured to position and weld hardbanding onto a tool-joint. This is an established process that has worked well for many years. However, with cost increases related to transporting pipe to and from a facility, the cost to transport a unit to, or near a drilling site, potential downtime and the remote nature of many drilling operations, a cost effective alternative has been developed that allows for by-hand installation and removal of a hardfaced sleeve, while on the rig floor.

The most widely-used "casing friendly" drill pipe hard facing products include: Arnco 100XT, 200XT, 300XT and WearSleeve (from Arnco Technology); TCS8000 and TCS Titanium (from NOV Tuboscope); Armacor M (from Liquidmetal Technologies); and SmoothX and Super SmoothX (from VAM Drilling). Tungsten carbide hardbanding products are available from multiple sources.

The global hardbanding market is estimated to have totaled almost $32 million in 2009. On a global basis the primary independent suppliers of hardbanding materials are Arnco Technology Trust, Postle Hardbanding Solutions, and Liquidmetal Technologies. In addition, drill pipe manufacturers that also supply hardbanding products include Hilong, NOV Grant Prideco (through its Tuboscope division), and VAM Drilling. The major participants in the Chinese hardbanding market include Hilong and Arnco.

Hardbanding Market ($ Million)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	$ 8	$ 8	$ 8	$ 9	$ 8	$ 8	$ 8	$ 9	$ 9	$10	$11
North America	$20	$22	$22	$24	$15	$21	$25	$27	$29	$32	$34
South America	$ 2	$ 2	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 4	$ 4	$ 4
Europe	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1
Africa	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 2	$ 2	$ 2
Mid East	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 2	$ 2	$ 2
Far East	$ 1	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 3
Russia	$ 4	$ 5	$ 6	$ 7	$ 2	$ 3	$ 6	$ 9	$ 9	$10	$11
Central Asia	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 2
Total	$38	$43	$44	$48	$32	$41	$49	$55	$59	$64	$68

Source: Spears and Associates

The Fearnley Procter NS-1 standard was originally developed by Shell covers products that have been reviewed and qualified by the Fearnley Procter NS-1 Technical Review Committee consisting of industry experts including users, manufacturers and consultants of drilling and well completion equipment. Those manufacturers that have achieved the Fearnley Procter NS-1 certification for hardbanding products include: Hilong, through its subsidiary Shanghai Boteng; Arnco; NOV; Postle; and Pinnacle Oilfield Services.

GLOBAL OCTG AND LINE PIPE COATING MATERIALS AND SERVICES MARKET

Line Pipe Coating Materials and Services Market

Description

Steel pipelines are used to transport of natural gas, crude oil, water, petrochemical and petroleum products at high pressures over long distances. Line pipe coating involves the coating of onshore and offshore steel pipes with protective layers to prevent the corrosion both externally and internally from the surrounding substrate. External pipe coating also provides mechanical protection for the underlying steel pipe. Given that the pipes are generally bare steel, coating it with different layers of plastic and concrete prevents seawater or groundwater from attacking the steel pipe, prolonging its lifetime. Coating of pipes represents only 5 – 6 per cent of the total pipeline cost in the overall scheme of design, manufacturing and installation of a pipeline project, but plays a very critical role. Aside from providing corrosion and mechanical protection, the pipe coating must be flexible enough to bend with the pipe and applied evenly to prevent any pockets where corrosion may accelerate.

Types of Coating Materials and Services

Five main coating systems are used for onshore pipelines: three layer polyethylene (3LPE), three layer polypropylene (3LPP), fusion bonded epoxy (FBE or Dual FBE), coal tar enamel (CTE), asphalt enamel and polyurethane (PUR). The different systems are specified by pipeline owners and engineering firms depending on short- and long-term cost, captive usage, regional availability of the coating material, control on handling, transportation and installation of pipelines, and technical reasons.

Three Layer Polyethylene (3LPE) coating is dominant worldwide—with 50 per cent market share—for onshore pipelines, with the exception of North America. The trend is increasing with a greater number of projects coated with 3LPE in China, India and the Middle East. The increased acceptance of 3LPE is due to its broad operating temperature range (from -45°C to + 85°C) and ability to withstand very rough handling and installation practices without damage to the coating. 3LPE systems consist of an epoxy primer, a grafted copolymer medium density (MDPE) adhesive to bond the epoxy primer with a high density (HDPE) topcoat. HDPE based systems offer excellent mechanical protection and long-term aging performance.

Three Layer Polypropylene (3LPP) systems are recognized as excellent systems for offshore projects with elevated operating temperature (0°C to +140°C) and extreme mechanical stress on the pipes. Projects in the North Sea, Africa, Gulf of Mexico and Arabian regions have set new standards for 3LPP coatings, which provide access to deepwater gas and oil fields. 3LPP system consists of an epoxy primer, a grafted copolymer PP adhesive to bond the epoxy primer with a PP topcoat. Polypropylene (PP) systems with up to seven layers are increasingly gaining ground for technically challenging deep sea projects, with very high operating temperature, where several functional PP layers are used for thermal insulation foams. These foams, apart from insulation properties, should have high compressive strength so that they do not collapse under high external pressure in deep see environment. PP based systems offer excellent mechanical protection and long-term aging performance.

FBE is dominant in North America, United Kingdom and a few other countries but the trend is declining in favor of 3LPE and PP Systems. Some pipeline owners have graduated from coal tar coating to Dual FBE as the cost has become quite competitive after increases in coal tar prices.

Coal tar and asphalt enamel are both still used in some countries. Both systems are declining and suffer from health and environmental concerns.

Polyurethane (PUR) systems are mostly used for pipeline rehabilitation projects or girth weld coating. However, PUR systems suffer from health concerns.

Offshore, concrete weight coating (CWC) provides pipe stability and superior mechanical protection and is used for weight in negative buoyancy applications.

Manufacturing and Coating Processes

External line pipe coating can be applied (1) at the pipe manufacturing plant, (2) at mobile coating yards located close to the pipeline right-of-way, or (3) along the pipeline right-of-way (known as line travel coating or over-the-ditch coating). Each method has advantages and disadvantages; the process chosen for use will depend on several factors including cost, timeliness, and type of coating.

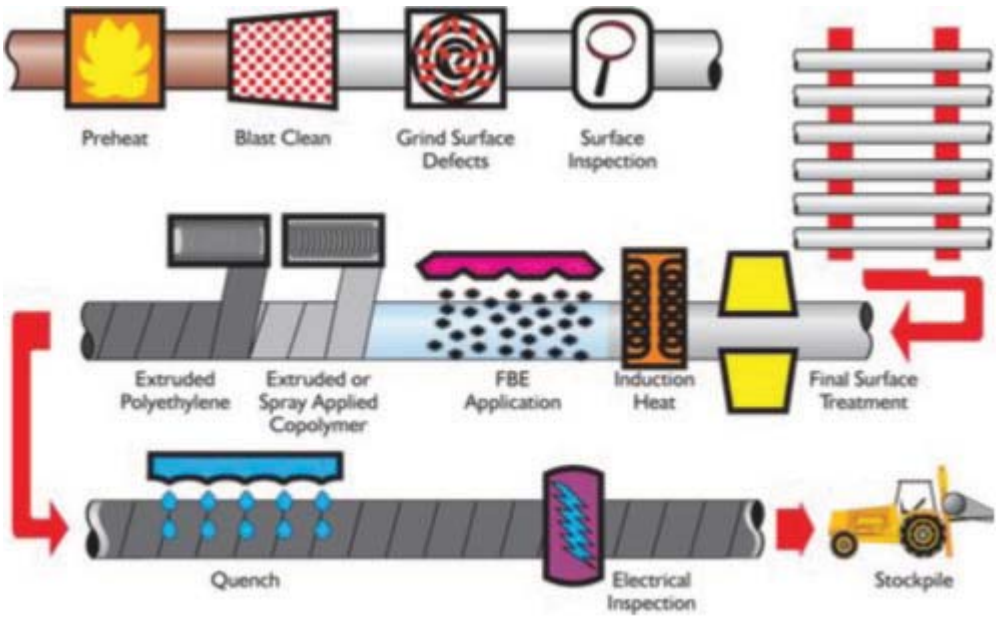
Plant-applied pipe coating generally provides the highest coating quality as well as provides the broadest range of type of coating to be used. On the other hand it requires hauling coated pipe over long distances, resulting in frequent loading and unloading operations which may lead to various kinds of damage to the pipe coating that could require expensive repair and/or risk the loss of coating integrity.

A mobile coating yard can be quickly assembled and disassembled, often in connection with a double or triple jointing yard to enable coating to be applied near the pipeline right–of–way. Mobile yard coating of double or triple jointed pipe also reduces the number of field joints to be protected. As a result, mobile coating yards generally have a lower risk of damage to the coating once it is applied than does plant-applied coating. However, because it is usually uneconomic to outfit mobile coating yards with expensive extrusion equipment, not all types of coatings can be applied at a mobile coating yard. As a rule, a mobile coating yard is most suitable for hot tape coatings, liquid coatings, cold tape coatings, and hot enamel coatings.

Line travel coating generally provides the lowest risk of damage to the coating once applied, but generally does not equal the quality of plant coated pipe. Also, not all types of coatings can be applied in a line travel coating environment. As a rule, line travel coating is most suitable for hot tape coatings, liquid coatings, cold tape coatings, and hot enamel coatings.

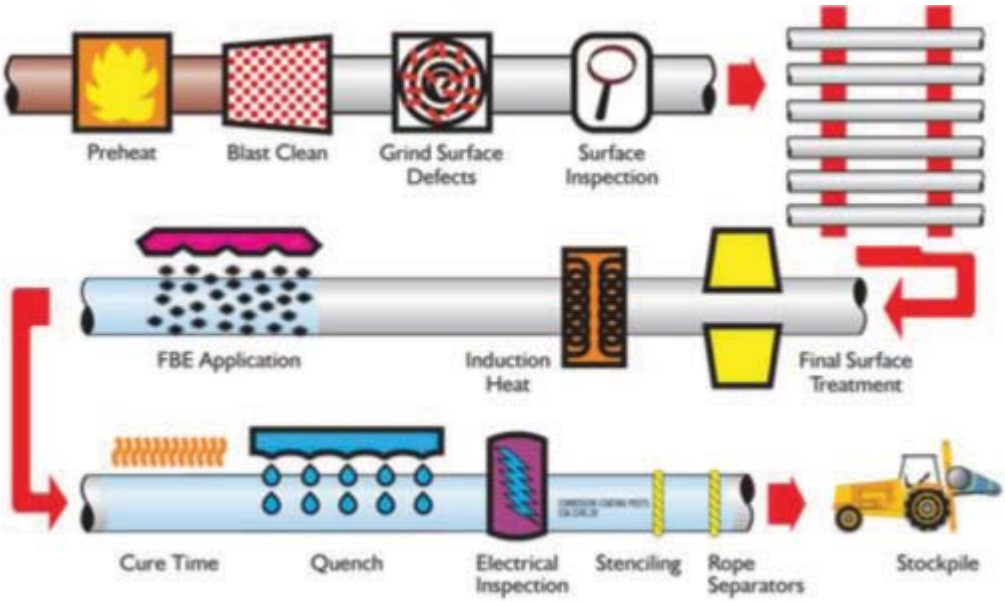
External plant-applied coating processes

3LPE/3LPP product application process:



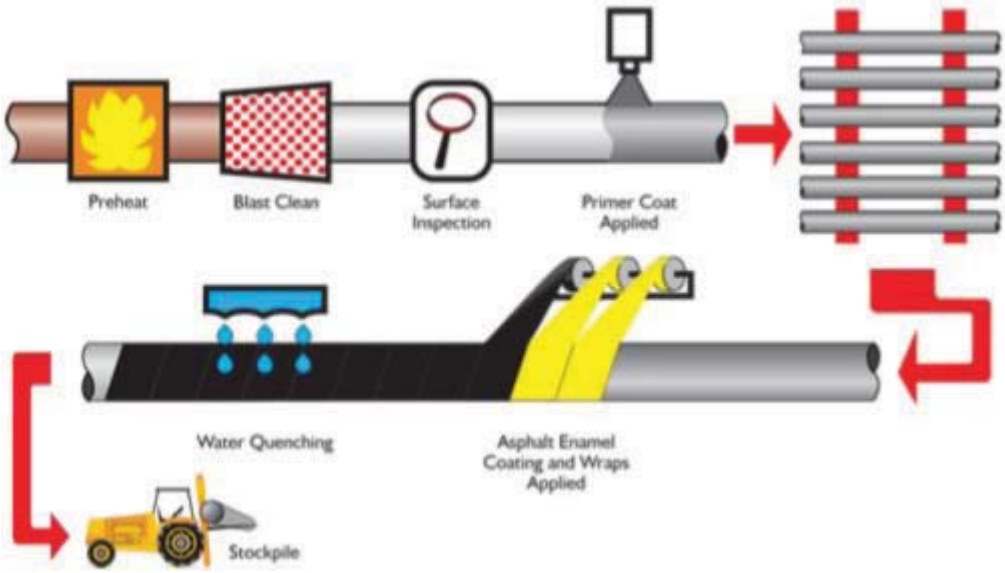
Source: BrederoShaw

FBE product application process:



Source: BrederoShaw

Asphalt enamel product application process:



Source: BrederoShaw

Three-layer hot tape coating is most often used at mobile coating yards and for line travel coating for pipe in excess of 36 inches in diameter. Hot applied polyethylene tape has been developed in order to allow application of three-layer coating in semi-stationary plant conditions without the use of expensive extruders. A three–layer system consists of a heat activated primer, a layer of heat sensitive elastomer coating, and an outer polyolefin layer. The layers thermally fuse and bond together during application. These ready-to-use tapes are delivered in rolls.

Internal line pipe coating is a multi-step process generally performed at the plant. It typically consists of:

- First internal pipe heating

- Internal pipe surface degreasing
- Second internal pipe heating
- First internal pipe surface blast cleaning
- Internal surface quality examination
- Second internal pipe surface blast cleaning
- Internal surface blowout
- Internal surface preparation quality inspection
- Pipe coating application (in coating chamber)
- Internal coating pre-curing
- Pipe induction heating
- Pipe coating curing in the full-polymerization chamber
- Internal flow coating quality inspection (visual)
- Pipe marking and storage

Market Outlook

Due to massive growth in pipeline construction activity, driven by a global re-mapping of the energy demand and supply, the worldwide petroleum industry line pipe coating market has increased from over 1,050 million square feet in 2005 to approximately 1,975 million square feet in 2009, for an annual average growth rate of 17.0%. Based on the outlook for pipeline construction, worldwide petroleum industry line pipe coating demand is projected to exceed 2,600 million square feet by 2015.

Line Pipe Coating Demand (Mil Sq. Ft.)

Category	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	141	246	312	408	412	325	334	344	355	365	376
North America	184	171	184	220	234	259	266	274	283	291	300
South America	72	36	32	79	130	66	68	70	72	74	76
Europe	24	13	49	30	12	30	31	32	33	34	35
Africa	5	60	35	107	172	234	241	248	256	264	271
Mid East	54	132	213	366	482	729	751	773	797	820	845
Asia Pacific	330	574	728	613	412	325	334	344	355	365	376
Russia	163	91	339	209	81	206	212	218	225	231	238
Central Asia	82	46	170	105	41	103	106	109	112	116	119
Total	1,055	1,370	2,063	2,137	1,977	2,275	2,343	2,414	2,486	2,561	2,637

Source: Spears and Associates

Macro Drivers of Line Pipe Materials and Coating Demand

According to Pipeline and Gas Technology[8], approximately 26,900 miles of oil and gas transmission pipeline is expected to be installed worldwide in 2010, up 3.4% from 2009. We project that oil and gas pipeline construction will increase at a 3% CAGR over the 2010 to 2015 timeframe, to a total of more than 31,000 miles of newly-installed pipeline in 2015.

Miles of Transmission Line Installed

Category	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
North America	5,557	5,168	5,550	6,625	7,050	7,800	8,034	8,275	8,523	8,779	9,042
South America	2,866	1,424	1,289	3,152	5,185	2,608	2,686	2,766	2,849	2,935	3,023
Europe	2,048	1,148	4,262	2,627	1,022	2,583	2,661	2,740	2,823	2,907	2,995
Africa	42	516	301	919	1,483	2,018	2,078	2,140	2,205	2,271	2,339
Mid East	462	1,139	1,838	3,152	4,156	6,281	6,469	6,664	6,863	7,069	7,281
Asia Pacific	4,063	7,070	8,960	8,800	7,104	5,596	5,764	5,937	6,115	6,298	6,487
Total	15,039	16,465	22,200	25,275	26,000	26,885	27,692	28,522	29,378	30,259	31,167

Sources: Pipeline and Gas Journal; Spears and Associates

The increase in global pipeline construction is driven by the increasing demand for energy worldwide. The US Energy Information Administration (EIA) forecast world marketed energy consumption to increase by 44% through 2030. Energy demand growth will be strongest among non-OECD countries, led by China and India, where combined energy use will nearly double over the projection period to 28% of world energy consumption.

A few major planned or proposed pipeline construction projects are profiled below:

The 1,252 km, 48-in. OD Gasoducto del Noreste pipeline will deliver 3.2 bcfd of Bolivian gas to Argentina as early as 2015.

PetroChina expects to bring its second West-East Pipeline into service by early 2011; it is part of the larger Asian Gas Pipeline, running from Turkmenistan to eastern China.

The first stage of the 4,700-km East-Siberia Pacific Ocean oil pipeline was inaugurated in December 2009. The second stage involves construction of a pipeline link between Skovorodino and Kozmino by 2012.

Plans call for a 771-km crude pipeline between Maday Island in western Myanmar and China's southwestern Yunnan province. A companion natural gas pipeline from Myanmar to southwestern China is scheduled to begin operation in 2012.

The Nord Stream pipeline is scheduled to start operations in fourth-quarter 2011. The project includes building a second, parallel pipeline planned to come on stream in 2012.

Gazprom and Eni agreed to build the 560-mile South Stream gas pipeline under the Black Sea and through Bulgaria. Participants plan to deliver first gas by 2013.

Stage 1 of the proposed 56-in. Nabucco pipeline calls for 2,000 km of pipe between Turkey, and Austria to be built by 2014. Second-stage construction would begin in 2012 and build eastward from Ankara to the Iranian and Georgian borders, bringing total pipeline length to 3,300 km.

Russia is building a multiline gas transmission system connecting the Yamal Peninsula and central Russia to deliver gas from Bovanenkovo field with production starting in 2011. Total pipeline length will exceed 2,400 km.

8 January/February 2010, "Worldwide Construction Forecast"

Iran and Pakistan plan a project that would transport gas from the South Pars field in the Persian Gulf through 1,850 km of 56-in. OD line. Iran's IGAT IX pipeline, slated for 2014 completion, will move gas 1,863 km from Asalouyeh to the Turkish border.

The proposed 4,300 km Trans-Sahara gas pipeline would transport gas from the Niger Delta into Algeria and Europe. No date has yet been given for the start of work.

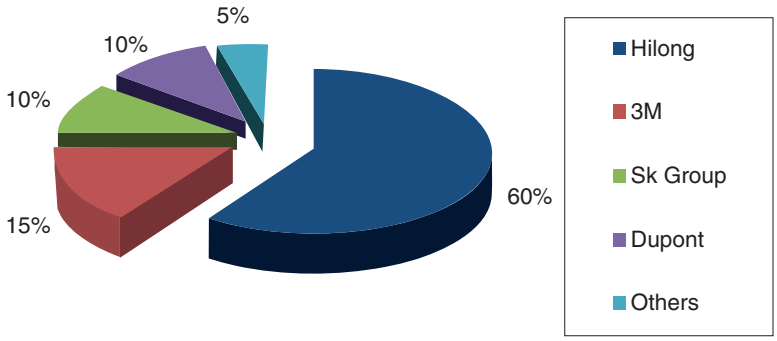
Algeria plans to build a 585-km natural gas pipeline from Hassi R'mel to an LNG terminal at Skikda; pipeline completion is expected in 2011. The Galsi natural gas pipeline will deliver Algerian gas to Italy via Sardinia; it is expected to begin operation by 2012-13.

Line Pipe Coating Material Suppliers

On a global basis the leading suppliers to the estimated US$625 million steel line pipe coating materials market (2010) include 3M, DuPont, Akzo Nobel, Socotherm, Borealis/Borouge, and LyondellBasell. The global market is dominated by 3M which is estimated to do over US$800 million per year in pipe coatings, across all industries (steel line pipe, refining/petrochemical, water, etc.)[9].

Hilong is the leading supplier to the Chinese steel line pipe coating materials market, capturing approximately 30%-40% of the Chinese market in 2007, 50% of the Chinese market in 2008, and 60% of the Chinese market in 2009. Other significant players in the Chinese line pipe coating materials market include 3M (with an estimated 15% of the 2009 market), SK Group (10%), and Dupont (10%).

Chinese Line Pipe Coating Materials Market - 2009 Sales



Fusion Bonded Epoxy (FPE)

Fusion bonded epoxy coating (FBE) is a powder-based coating used to coat and protect steel pipeline, piping connections, and valves. It is comprised of four separate components: resin, hardener, fillers, and color pigments. Resin and hardener comprise the adhesive element of FBE, and are often referred to as the "binder." The epoxy resin is comprised of resin molecules that each carry one oxygen atom and two carbon atoms, which are highly reactive. When mixed with hardener, the resin and hardener react and adhere to the substrate. The hardener itself is what determines many qualities of the final fusion bonded epoxy mix, such as flexibility and chemical resistance. The addition of fillers and pigment can alter properties such as hardness, thickness, permeability, and color. FBE is made by mixing and blending all four components; the resulting dry mixture enters an extruder, where the mixture is compressed, heated, and melted until semi-liquid. The mixture is then extruded and passed between rollers until it forms a solid sheet. The sheet is then cut into tiny pieces, which are then ground up into powder. The final powder mixture is then packaged and sold. The leading FBE suppliers include Hilong, 3M (the Scotchkote brand of FBE powder coatings), DuPont (NapGard), Akzo Nobel (Resicoat), Socotherm (Powderkote), and SK Group.

9 Source: Rodman Publishing

3M (USA) has been the primary global supplier of fusion bonded epoxy coatings for pipelines since 1960, and its Scotchkote materials have been used to coat more pipelines worldwide than any other fusion bonded epoxy product.

Three Layer Polyethylene (3LPE)

3LPE coating is dominant worldwide for onshore pipelines, with the exception of North America. 3LPE systems consist of an epoxy primer, a grafted copolymer medium density (MDPE) adhesive to bond the epoxy primer with a high density (HDPE) topcoat. HDPE based systems offer excellent mechanical protection and long-term aging performance. The leading 3LPE suppliers include Hilong, Borealis/Borouge (the Borcoat brand of products), Socotherm (Plastikote), and LyondellBasell.

Three Layer Polypropylene (3LPP)

3LPP systems are recognized as excellent systems for offshore projects with elevated operating temperature (0°C to +140°C) and extreme mechanical stress on the pipes. 3LPP system consists of an epoxy primer, a grafted copolymer PP adhesive to bond the epoxy primer with a PP topcoat. PP based systems offer excellent mechanical protection and long-term aging performance. The leading 3LPP suppliers include Hilong, Borealis/Borouge (the Borcoat brand of products), and Socotherm (Plastikote).

Coal Tar Enamel

Coal tar and asphalt enamel are both still used in some countries. Both systems are declining and suffer from health and environmental concerns. In addition, some pipeline owners have moved from coal tar coating to Dual FBE as the cost has become quite competitive after increases in coal tar prices. The leading coal tar enamel suppliers include Carboline (USA).

Competitive Environment

In all markets the demand for line pipe coating materials is driven by the construction of new pipe lines and the replacement of existing line pipe. New pipeline construction is a much larger component of the market for line pipe coating materials than the replacement of existing line.

Since coating material is used in "critical service" applications (i.e., harsh, abrasive conditions), in all markets material quality is the key factor in vendor selection. While material quality is the paramount factor, deliverability, service, and price can also play a role in determining the winning bid.

Several factors enter into the consideration of which type of coating material (three layer polyethylene (3LPE), three layer polypropylene (3LPP), fusion bonded epoxy (FBE or Dual FBE), coal tar enamel (CTE), asphalt enamel and polyurethane (PUR)) is most appropriate for the job at hand: short- and long-term cost, captive usage, regional availability of the coating material, control or handling, transportation and installation of pipelines, and technical reasons. The pipeline operating company and the engineering firm managing the pipeline construction project determine the type of coating material to be used.

Pipeline companies are the primary customer for line pipe coating services, although the construction of a new pipeline is typically carried out by an engineering/construction firm working for the pipeline company and who generally selects the pipe coating materials firm after a competitive bid process involving companies on an approved vendor list. Since most line pipe coating is applied at the pipe plant, proximity to the pipe plant is often a key consideration in line pipe coating materials vendor selection. Other important factors include past experience, quality, safety, and price.

A significant barrier to penetrating the line pipe coating materials market is the time and cost required to establish a proven track record necessary for general market acceptance. Products designed to address the critical service segment of the market will require considerable technical expertise and significant research and development budgets. In addition, the coating materials manufacturing process requires expertise in chemistry,

heat treatment, and manufacturing processes that are required to produce a high-quality product. As a result, firms entering the line pipe coating materials market must have significant financial and technical resources.

In China demand for line pipe coating materials is highly concentrated. Two companies (CNPC and Sinopec) control both the construction and operation of almost all of the oil and gas transmission pipelines in China. In China the leading line pipe coating materials manufacturer (Hilong) is estimated to hold about 60% of the 2009 market. Other significant players in the Chinese line pipe coating materials market include 3M (with an estimated 15% of the market), SK Group (10%), and Dupont (10%). These line pipe coating materials companies have developed close working relationships with coating applicators, pipeline engineering and construction firms, and pipeline operators in China through training and certification programs.

In terms of demand, the line pipe coating materials market outside China is divided among several hundred pipeline companies, the largest of which is estimated to account for less than 5% of the overall market. As a result, market penetration requires significantly more marketing and sales resources than is the case in China. Outside of China the line pipe coating materials market is supplied by a number of large, diversified multinational firms with significant technical expertise, proprietary technology, extensive manufacturing networks, and proven records of performance. Most of these companies are focused on addressing critical service applications (either due to operating conditions or construction constraints) requiring innovative technical solutions. Many of these multinational line pipe coating materials companies have developed close working relationships with coating applicators, pipeline engineering and construction firms, and pipeline operators in many countries through training and certification programs. In addition, local or regional coating materials vendors supplying low-cost coating products such as FBE will also compete in non-critical service applications.

R&D and Innovation Trends

The coating systems for pipelines have evolved over the years through Coal Tar enamel coating, Asphalt Enamel coating, PE Sinter coating, 2LPE coating, PU coating, FBE coating, 3LPE and 3LPP coatings and is progressing further. However, in all the new innovations, the key objectives have been:

- To improve the toughness of the coating (impact, abrasion etc),
- To increase the operating temperature range (both on lower and higher side).
- To secure long term properties (Cathodic disbondment, Peel strength, weathering, UV and heat resistance, environmental stress crack resistance

Additional challenges for pipeline engineers are the increasingly aggressive contents and the harsher operating conditions for oil and gas. There are still challenges that face the line pipe coating industry due to the many unique applications, such as cold climates and deep water environments.

Several new line pipe coating products are under development including a PE top coat with very high resistance to slow crack growth, machine applied PE for field joint coatings, PP weight coating and PP injection molded systems for field joint coating.

OCTG Coating Materials and Services Market

Description

OCTG coating involves the coating of casing, tubing, and drill pipe in order to prevent corrosion and wear and to enhance equipment performance. Specialized coating service firms are used to perform OCTG pipe coating operations; in addition, the larger OCTG coating service firms also provide pipe inspection services.

Tuboscope invented the internal tubular coating process in the 1930s; however, drill pipe coating only began in the 1950s. While tubing and drill pipe are routinely coated because they are continually in contact with harsh

or abrasive fluids, casing is less likely to be coated as it less likely to be employed in environments where it may need protection from wear or corrosion.

The original drill-pipe coatings were liquid films that were sprayed on, then left to dry. Powder coatings were introduced in the 1970s to cut the use of solvents and emissions.

Coating Processes

The first step in the drill pipe coating process is that the pipe is thermally cleaned and the internal surface is blasted with grit for a good anchor pattern preparatory to coating. A two stage application of phenolic/epoxy liquid coatings is sprayed on to the internal surface of the drill pipe in a controlled manner and thermal cured at each stage. This ensures uniform coating thickness and quality throughout the length of the drill pipe.

A liquid-applied coating usually contains ceramic material loaded in an epoxy binder resin. After being sprayed though the pipe, the pipe goes through a conveyorized oven for curing.

In a powder coating operation the drill pipe is first thermally cleansed at 750° F for up to12 hours. A primer is then applied to the bare steel, the pipe reheated and powder blown though it. After the powder melts, the pipe goes through a conveyorized oven for curing.

A similar process used to coat casing and tubing.

In oilfield operations, the drill-pipe exterior generally remains uncoated except for rust preventive varnish since routine contact between the drill pipe and the wellbore can quickly strip away any exterior coating.

Market Outlook

The OCTG coating services market is tied to drilling activity, especially deep drilling, and demand for higher end tubulars. The coating industry is driven by overall drilling activity, a shift towards deeper drilling, replacement of aging tubulars, and a growing focus on safety.

North America is the most important market for OCTG coating materials and services, accounting for 55%-60% of the global market, followed by China (11%), and Russia (12%). In all, we estimate that the global market for OCTG materials and coating services totaled $188 million[10] in 2009. Based on the outlook for future drilling activity, and assuming OCTG materials and coating prices rise 4%-6% per year going forward, the worldwide OCTG materials and coating services market is projected to reach $387 million in 2015, for a CAGR of 12.8%.

OCTG Coating Materials and Services Market ($ Million)

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	31	32	35	40	22	22	38	41	43	46	48
North America	123	142	147	169	105	152	181	194	210	226	243
South America	10	11	13	15	14	15	17	18	19	21	22
Europe	3	3	3	4	3	3	4	4	4	4	5
Africa	3	5	5	6	5	6	7	7	8	9	10
Mid East	5	5	6	7	6	6	7	7	8	8	9
Far East	6	7	7	9	8	8	9	10	11	12	13
Russia	11	15	18	22	22	23	26	28	29	32	34
Central Asia	2	3	3	3	3	3	3	4	4	4	4
Total	**194**	**223**	**238**	**273**	**188**	**239**	**291**	**312**	**336**	**361**	**387**

Source: Spears and Associates

10 Includes the value of both coating materials and coating services

OCTG Market Penetration

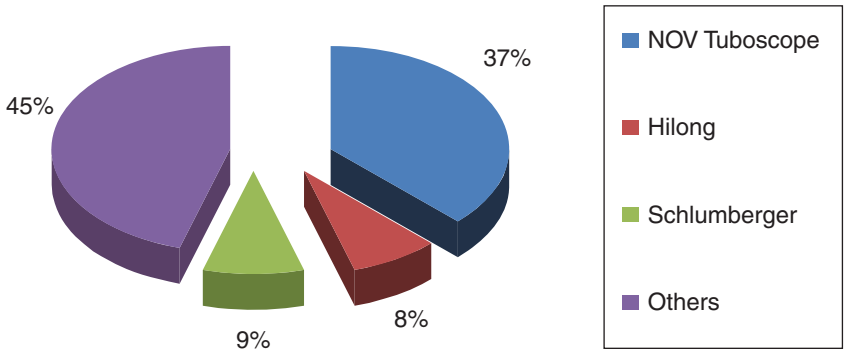
It is estimated that currently about 90% of all tubing and drill pipe is coated; as a result, it would appear that further penetration of the OCTG market by coating applicators is limited.

Most drill pipe owners (drilling contractors and rental yards) routinely coat their drill pipe in order to improve its performance and extend its useful life. The roughness of the steel within the drill pipe inhibits the flow of the drilling fluid due to friction. At the same time, uncoated pipe deteriorates from corrosion pitting, especially around the critical box and pin connections. As a result, by internally coating drill pipe, mud-pump mud-pump flow rates can be increased by as much as 15% and mud pump pressure can be better controlled, while at the same time significantly increasing the useful life of drill pipe. The cost of coating is typically about 8%-10% of the cost of the drill pipe, however coatings have been shown to increase drill pipes life by a factor of 2X while at the same time reducing mud pump horsepower requirements by 10%-25%.

OCTG Materials and Coating Service Firms

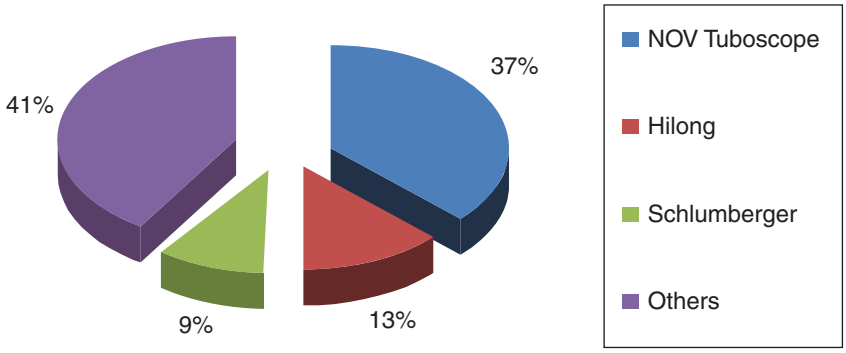
In terms of revenues the global market for OCTG coating materials and services is estimated to have totaled $238 million in 2007. NOV Tuboscope is estimated to have captured 37% of the global market in 2007, followed by the Hilong Group (8%) and Schlumberger (9%). See the following chart.

Global OCTG Coating Materials and Services Market - 2007 Sales



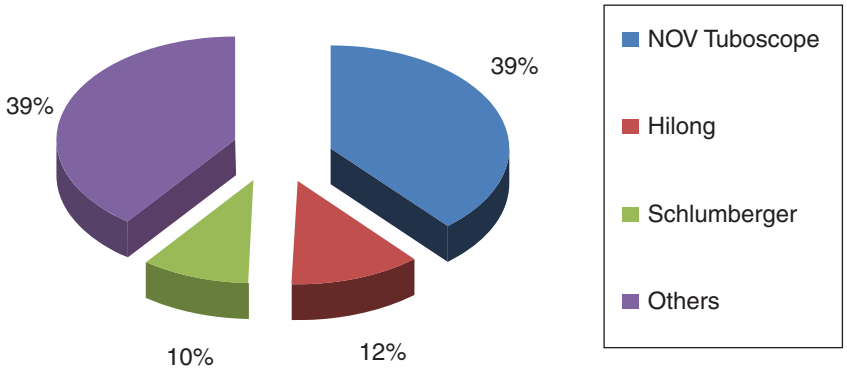
In terms of revenues the global market for OCTG coating materials and services is estimated to have totaled $273 million in 2008. NOV Tuboscope is estimated to have captured 37% of the global market in 2008, followed by the Hilong Group (13%) and Schlumberger (9%). See the following chart.

Global OCTG Coating Materials and Services Market - 2008 Sales



In terms of revenues the global market for OCTG coating materials and services is estimated to have totaled $188 million in 2009. NOV Tuboscope is estimated to have captured 39% of the global market in 2009, followed by the Hilong Group (12%) and Schlumberger (10%). See the following chart.

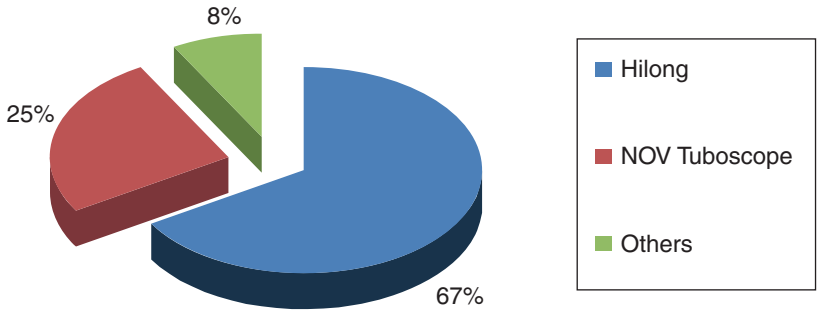
Global OCTG Coating Materials and Services Market - 2009 Sales



Source: Spears and Associates

Hilong is the leading Chinese OCTG materials and coating service firm, capturing approximately 60% of the Chinese market in 2007, two-thirds of the Chinese market in 2008 and two-thirds of the Chinese market in 2009. The second-largest vendor in the Chinese OCTG materials and services market is NOV Tuboscope, with an estimated 25% of the Chinese market.

Chinese OCTG Coating Materials and Services Market - 2009 Sales



The North American market is dominated by NOV Tuboscope, with 30%-40% of the market, followed by Schlumberger (10%-15%), Shawcor (5%-10%), and RPC (5%-10%). Other suppliers are estimated to hold 40%-50% of the North American OCTG coating market.

Outside of North America, and excluding Russia and China, the OCTG materials and coating services market is led by NOV Tuboscope (with an estimated 60%-65% of the market), Schlumberger (15%-20%), and Shawcor (10%-15%). Other suppliers are estimated to capture 10%- 15% of this market.

Hilong is reported to have an annual coating capacity of over 5 million meters per year (drill pipe coating 2.4 million meters; tubing coating 2.26 million meters; and casing coating 370 thousand meters). The group has become the largest company alliance in coating business in China, with a approximately two-thirdsof the Chinese market.

The Tuboscope division of National Oilwell Varco (NOV) is the largest OCTG coating service firm outside China. In China NOV has a joint venture with the Huabei Petroleum Administration Bureau to coat drill pipe.

HHTCC, a Joint Venture between Tuboscope and HYYJ, set up its second coating line on the premises of DP Master which went into operation in Sept 2007 with a coating capacity of 12,000 joints per month.

Schlumberger is a diversified oilfield service firm with operations around the world. Its Smith Services division is primarily involved in the inspection and coating of drill pipe.

OCTG Coating Material Suppliers

The leading OCTG coating material suppliers include Hilong, NOV Tuboscope, and Schlumberger (Smith International).

Hilong produces the TC series of coating and anti-corrosion materials for use on drill pipe, tubing, casing, and line pipe.

Key OCTG coatings available from NOV Tuboscope include DPC, TK-34 and TK-34XT liquid coatings and TK-34P, TK-34XT, TK-236 and TK-216 powder coatings. In all, Tuboscope has around 40 internal plastic coatings to protect drill pipe and line pipe specifically. The technology uses phenolics, epoxies, urethanes, novolacs and new thermoplastics designed to address the operating needs of specific oilfield environments.

Schlumberger (Smith International) commercializes Sub-One Technology's advanced InnerArmor coating technology for OCTG applications. The joint venture, Smith InnerArmor Technologies, has the exclusive license to supply a full range of OCTG coatings on a global basis. Sub-One Technology is a privately held company backed by Chevron, General Electric, Nomura, and Advanced Technology Ventures.

Competitive Environment

In all markets the OCTG materials and coating services market is tied to drilling activity, especially deep drilling, and demand for higher end tubulars. The coating industry is driven by overall drilling activity, a shift towards deeper drilling, replacement of aging tubulars, and a growing focus on safety.

The most important factors in vendor selection are local market presence, quality of service, technology, and price. Over time, oil and gas companies (which own casing and tubing) and drilling contractors (who purchase drill pipe) are increasingly requiring sophisticated tubular tracking and management skills from their OCTG coating and inspections suppliers as they seek to maximize the useful life of the OCTG assets.

Since proximity to the oil field can be a key factor in the OCTG coating vendor selection process, OCTG coating companies provide services from regional operating bases located in major oilfield equipment supply centers.

The OCTG coating materials and services industry is a mature market served by well-established vendors. Most firms that provide coating services also provide inspection services and some will also provide tubular maintenance services. A significant barrier to penetrating the OCTG coating materials and services market is the time and cost required to establish a proven track record necessary for general market acceptance with both pipe mills and their customers (oil and gas companies and drilling contractors). In addition, the cost of and operating expertise associated with inspection technology acts an entry barrier to the inspection segment of the OCTG market.

In China demand for OCTG coating materials and services is highly concentrated. Two companies (CNPC and Sinopec) are estimated to account for about 90% of the market for OCTG in China. Based on 2009 sales, Hilong is the leading Chinese OCTG materials and coating service firm, capturing approximately two-thirds of the Chinese market, followed by NOV Tuboscope with an estimated 25% of the Chinese market. In China NOV Tuboscope has a joint venture with the Huabei Petroleum Administration Bureau to coat drill pipe. HHTCC, a Joint Venture between NOV Tuboscope and HYYJ, set up its second coating line on the premises of DP Master which went into operation in Sept 2007 with a coating capacity of 12,000 joints per month.

In terms of demand, the OCTG coating materials and services market outside China is divided among several hundred companies, the largest of which is estimated to account for less than 5% of the overall market.

As a result, market penetration requires significantly more marketing and sales resources than is the case in China. Major customers for OCTG coating services include oil and gas producers (45%), steel mills (25%), drilling contractors (20%), and tubular supply companies (10%). Larger drilling contractors and oil and gas producers have new pipe internally coated after delivery and have rigorous programs for inspecting and maintaining used pipe. In terms of supply, outside of China the OCTG coating materials and services market is highly consolidated. NOV Tuboscope dominates this market with approximately 50% of the North American market and approximately 80% of the international (excluding Russia and China) market.

R&D and Innovation Trends

The challenges for drill pipe coating engineers include higher downhole temperatures, increasingly acidic drilling fluids, and improved friction loss properties. Newer drill pipe powder coating materials have the ability to withstand formation temperatures of about 400 F, allowing circulation to be reduced without sacrificing performance. Powder coating also performs well with drilling fluids such as zinc bromides and the acids used to drill some wells. Powder coatings have a lower coefficient of friction, allowing higher mud flow rates, allowing drilling contractors to reduce the size of the mud pumps and rig weight at significant savings in total well costs.

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