

Atlas Copco



OIL & GAS

PERSPECTIVES IN OIL & GAS

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Who We Are - Atlas Copco Drilling Solutions

Atlas Copco Drilling Solutions (ADS) is a business unit within the Construction and Mining Technique.

Atlas Copco Drilling Solutions designs, manufactures, and markets a wide range of rotary drilling equipment, including models specifically designed for surface mining, water well, exploration, and shallow oil and gas applications around the world. ADS headquarters and main production plant are located in Garland, Texas, USA, with additional manufacturing facilities in India and China.

ADS considers training, service and maintenance key factors in helping customers achieve maximum performance and low drilling costs. Therefore, Atlas Copco Drilling Solutions works closely with its customers to provide these services through local sales and technical service support teams. Building lasting relationships with customers and working together to achieve mutual success are Drilling Solutions' goals.

History of Technological Expertise

Atlas Copco Drilling Solutions' parent is Atlas Copco, a Swedish industrial company that was founded in 1873. It manufactures industrial tooling and equipment.

The Atlas Copco Group is a global industrial group of companies headquartered in Stockholm, Sweden. Revenues for 2006 totaled BSEK 51 (\$7.6 billion US). The Group employs more than 26,000 people. The Atlas Copco Group manufactures products at 56 production sites in 19 countries. The Group's global reach spans more than 150 markets.

Three different business areas comprise the Atlas Copco Group:

1. **The Compressor Technique** – Develops, manufactures, markets and services oil-free and oil-injected stationary air compressors, portable air compressors, gas and process compressors, turbo

expanders, electric power generators, air treatment equipment and air management systems.

2. **The Construction and Mining Technique** – Develops, manufactures, markets and services rock drilling tools, construction and demolition tools, drill rigs and loading equipment.

3. **The Industrial Technique** – Develops, manufactures, and markets industrial power tools, assembly systems, aftermarket products, software and service.

The Atlas Copco Drilling Solutions business is a part of The Construction and Mining Technique and has a rich history dating back over 135 years.



Two Drilling Legends Combine

Ingersoll-Rand traces its origins to 1871. At that time, Simon Ingersoll and three Rand brothers—Addison, Albert and Jasper—separately set in motion events that would lead to the formation of Ingersoll-Rand. Simon Ingersoll was a New England farmer whose passion for mechanical tinkering yielded 27 patents over his lifetime. His steam-powered rock drill, patented in 1871, immediately proved superior to other drills of the era and became the cornerstone of the Ingersoll Rock Drill Company. The Rand brothers organized the Rand Drill Company in 1871 as a means to sell more blasting powder. Better drills would increase productivity, which would increase demand for blasting powder. The complementary nature of the companies' product lines and served markets created an appealing vision of a combined enterprise. In 1905, the two companies merged, thus establishing Ingersoll-Rand and launching one of the

world's more successful and influential industrial firms.

A short time after Simon Ingersoll had patented a steam-powered rock drill in 1871, Atlas Copco expanded their interest from steam locomotives and machine tools to pneumatic tools, compressors and their first steam-powered rock drill, which was introduced in 1905. Over the years, Atlas Copco refined its innovative steam powered rock drill and continued to expand and diversify its business.

From humble beginnings, both companies earned a reputation worldwide for their innovative drill products and unparalleled service and support.

In 2004, Ingersoll-Rand Co. Ltd. agreed to sell its Drilling Solutions business unit to Atlas Copco AB. This transaction resulted in one of the world's most comprehensive and innovative drill product offerings, while further enlarging the Atlas Copco reach throughout the world.

Roots in Oil & Gas

In the mid-1970's Ingersoll-Rand's (IR) Rotary Drill Division began marketing T4W rigs to contractors in Northern Appalachia to drill 1,000 – 1,500 ft. wells for coal degasification.

As the energy crisis of the 1970's deepened, companies began drilling production wells to harvest coal-bed methane (CBM). To meet demand, rigs like the RD10 were developed with capability to drill to 3,000 ft. and set Range II casing. These rigs were also used to drill shallow natural gas wells in Appalachia and the mid-west. As CBM and shallow gas drilling expanded, rigs with more depth capacity were required. In 1986, Ingersoll-Rand released the RD20 – it's first mobile, hydraulic rig designed and built specifically for gas and CBM drilling. Today, the RD20 is a high production rig with capability to drill wells to depths in excess of 5,000 ft.

Throughout this period, IR rigs specialized in air rotary and Down Hole Hammer (DHD) drilling. The company developed DHD drills and bits for deeper hole applications where large volumes of water were encountered. With the advent of larger, high-pressure

compressors on the rigs, penetration rates in medium to hard rock grew rapidly from 80-90 ft/hr to 150-180 ft/hr. Because of this drilling performance as well as the mobility and rapid rig up characteristics of the new drills, they replaced the traditional single and double mud rigs drilling in Appalachia, the mid-west and several international locations.

In addition to the evolution of shallow hydraulic rigs, IR was involved in other oil field businesses. They acquired the Cabot Company in Pampa, Texas that manufactured a line of service and work over rigs. A few years later, the company reached a joint venture agreement with Ideco, a major land-based rig manufacturer to form IRI. IR Compression Services located in Broken Arrow, Oklahoma, maintained a large fleet of mobile compressors to provide compressed air to the oil patch. IR skid and portable screw compressors also provided drilling air to rigs engaged in under-balanced drilling.

Throughout this period, the company steadily developed experienced people and products that became recognized in the oil patch for their quality and performance.

The "Mixed Fleet" Approach

The focus at Atlas Copco Drilling Solutions is to enhance the profitability of its customers. We believe that the use of proven new technology and continuous innovation will accomplish this goal by improving drilling and non-drilling performance, reducing manual labor content and enhancing safety. We also believe in designing rigs with a defined range of maximum performance, a "sweet spot" where the rig achieves the best results.

New products will be designed to be integrated into a fleet of rigs with different capacities and capabilities. The role of new Atlas Copco rigs will be to enhance the performance of the total fleet. Every drilling rig has a range of maximum performance. Outside that range, performance drops off and the cost per foot increases. For example, a 1500-hp triple is designed to drill holes in the 15,000-20,000 foot depth range.

Oil and gas wells are constructed in distinct segments.

- Drilling surface and intermediate holes and setting the casing.
- Drilling the production hole and setting the casing.

In horizontal drilling programs, a vertical hole is drilled and cased. Then one or more horizontal holes are drilled.

Each of these segments of a well requires different rig capacities to achieve optimum performance. A contractor's profitability depends on maintaining maximum performance and efficiency from the equipment in each segment of the well.

With the advent of lighter weight, mobile drills in the 700 to 1000-hp class, contractors have a rig that can drill shallow wells from spud to TD and support their larger drills by drilling pre-sets. These rigs and their related equipment can be mobilized quickly. There are fewer trailer loads that can be brought on location at a lower cost. These drills rig up quickly, often within one to three hours from the move on site to drilling. Their hydraulic drilling systems are very efficient drilling and casing surface and/or intermediate holes. In many cases, contractors are able to drill and set surface with these "pre-set" rigs in less time and with less personnel than it takes to mobilize and rig up a 1500-hp drill location. When the large rig moves on location, it can start drilling within its range of optimum performance.

The mixed fleet approach has been used by contractors to increase drilling and non-drilling performance while reducing the cost per well.

Product Offerings

Atlas Copco products have grown into the oil and gas market from shallow gas and CBM applications. The rigs were developed to meet the requirements of small, independent contractors who survived by increasing productivity and reducing cost.

Since Atlas Copco rigs began drilling for oil and gas, they have been designed to perform under the most severe conditions. Starting with the basic frame and derrick fabrications, each component undergoes a FMEA (Failure Mode and Effect Analysis), computer simulation modeling, strain gauge and stress testing as well as functional testing beyond the specified design criteria. Power systems are designed to perform under a severe-duty cycle so there is a margin of safety for emergency situations.

The RD20 is the first and only rig on the market with a patented carriage feed and derrick design. This innovation improves mechanical and hydraulic efficiency 10-12% over conventional designs. Even under full pullback, there is no compression loading on the crown and upper portion of the derrick. Force is directly applied to the main drill frame and rear cross member, the strongest part of the drill structure.

Atlas Copco believes that spending longer in the design and test phases of a new rig program pays dividends over the life of the rig. That's why a high percentage of the more than 250 RD20s built are still drilling and making money.

Today's Atlas Copco rigs are self contained and mobile. Drill functions are hydraulic-driven to provide a combination of quick response and precise control. Most drills are designed with on-board, high-pressure compressors so contractors can rig up and begin surface drilling in less than one hour. AC rigs also accommodate off-board compressors, boosters and mud systems.

All Atlas Copco products use hydraulic top-head drive and hydraulic cylinder-feed systems. These provide a wide range of speed and force, rapid response and precise control. Because of this, the rigs have excelled in applications where precise bit weight control is essential to performance. Hydraulic top-head drive has replaced the traditional rotary table, and hydraulic cylinder feed has replaced the drawworks.

Atlas Copco rigs use the top-head drive and cylinder feed systems to handle all tubulars. Pipe handling is rapid and efficient. The RD20 is easily adapted to hands-free pipe handling systems. Casing is also handled with the top-head and feed system. Casing is lifted and set with the feed system. Because it is attached to the rotary head, the operator has a precise torque control system to connect new sections to the string. The casing is spun together. Rotation stops when the pre-set torque is reached. If there is a need, the casing can be pushed, rotated and even circulated.

Atlas Copco future product designs will focus on expanding these operating systems to larger rigs. Use of field-proven technology will bring gains in operating efficiency that will control cost and enhance safety. These new, larger rigs will still maintain the mobility and rig-up advantages of smaller rigs. The primary design objective is to reduce cost by reducing time spent on non-drilling functions.



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Service & Training

Each time a new Atlas Copco drill is sent to the field – no matter where in the world it is sent – a master driller, supported by factory techs, accompanies it. Serving as the technical services demonstrator, the master driller is responsible for operator, maintenance / service and safety training. The master driller works with the crew and performs hands-on operator training, with an emphasis on safety. The master driller remains on site for as many days as it takes for everybody on the crew to be comfortable with the rig operation and for the demonstrator to feel confident that the rig will be operated safely and correctly.

As part of the start-up training, Atlas Copco personnel cover the recommended daily service program to ensure optimum rig performance, which is covered in the rig manual and documentation that stays with the rig.

The goal of the training is to emphasize safety... and then, re-emphasize it in order to provide the crew with a front-to-back understanding of the intricacies of the rig.

After the initial start-up training, Atlas Copco is available at a moment's notice for any maintenance, service or refresher training no matter where the rig is located.

Each Atlas Copco rig is exhaustively examined before it is shipped from the factory, and again, by a certified mechanic when it arrives at the customer site. The mechanic makes sure that all of the fluid levels are up, everything is greased, and all mechanical and hydraulic systems are working properly.

A key understanding at the company, is that Atlas Copco builds the product, maintains it and supports it throughout the life of the rig.

Engineering / R & D

Atlas Copco Drilling Solutions places a premium on engineering and research and development. There are two areas of focus: sustaining existing products and new product development. In Garland, Texas, there are about 50 certified engineers on staff, supported by 20-some test technicians and auxiliary / administrative personnel. Additionally, there are another 100 engineers located at an Atlas Copco engineering design center located in India. These resources make certain customer custom orders are satisfied as well as addressing warranty and emergency needs. Additionally, the company is fully engaged in competitive upgrades of existing products and innovating new products for the market.

Every Atlas Copco Drilling Solutions engineer visits the field regularly to observe and learn first hand from the rig operators what's working and what can be improved. This direct feedback from the field has been invaluable in creating new rig designs that are functional, safe and elegantly simple to operate.

Additionally, the Engineering / R&D department works closely with manufacturing to make certain that custom and new designs can be efficiently produced. A typical design project team will have a project manager (who is an engineer),

four to six design engineers, a materials sourcing agent, and a manufacturing / production engineer.

If necessary, specialty experts are invited in to consult on materials, processes or unique issues. Service and marketing meet frequently with the project team to ensure that there is a complete understanding of customer and market needs. The collaborative design approach yields the best solutions.



Our Facilities

The principal Atlas Copco Drilling Solutions manufacturing and engineering facilities are located outside of Dallas in Garland, Texas. The primary production facility features approximately 250,000 square feet of assembly space. The Company has doubled throughput from 2004 to 2006 and has improved production efficiency by 20% over the same period. Atlas Copco has invested more than \$10M in the business, adding cranes and other capital production equipment and improving business systems. Throughput and efficiency gains were achieved through improving material

management, employing flow manufacturing techniques, reorganizing the factory, and making capital investments where needed.

An 81,000 sq. ft. distribution center located in Allen, Texas is staffed by 70+ employees including a dedicated purchasing team for distribution, a dedicated traffic and customs team, international and domestic customer service, and a 24/7 on-call service support staff.

In 2007, Atlas Copco Drilling Solutions is scheduled to bring a new factory on line in India, adding approximately 25,000 square feet of assembly space to serve the Indian market.

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