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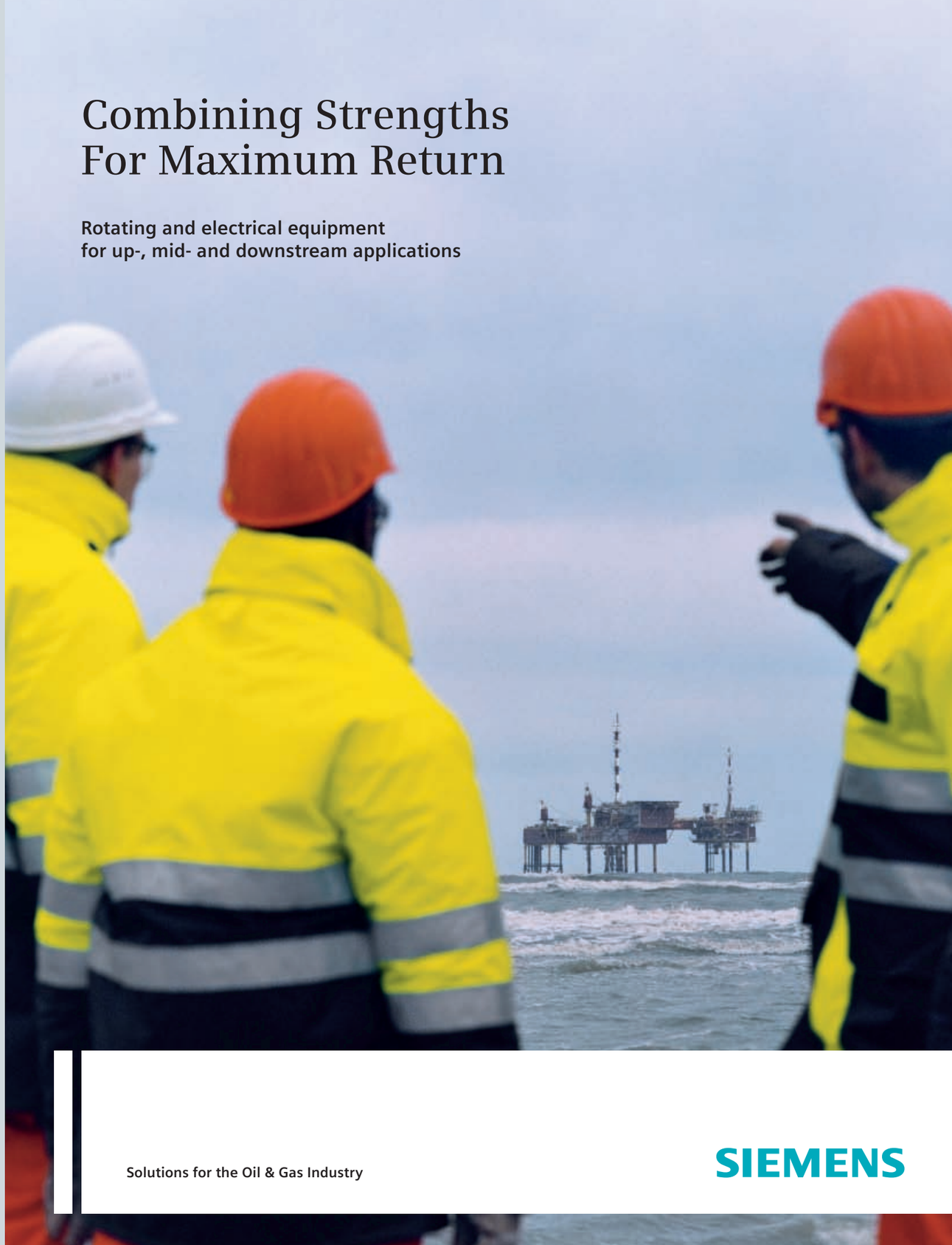
Order No.: A96001-S90-A522-X-4A00
Printed in Germany

Combining Strengths For Maximum Return

**Rotating and electrical equipment
for up-, mid- and downstream applications**



Solutions for the Oil & Gas Industry

SIEMENS

Connecting Competence

Comprehensive solutions customized to your needs

Global trends in the demand and supply of energy and petrochemicals require constant improvement of technologies and services. At the same time, processes previously considered uneconomic are in the focus of interest today. The world is heading towards different economies of scale.

And so is Siemens. Known to the world as a global powerhouse in electrical engineering and electronics, decades of strategic acquisition and successful integrations have shaped a company with unparalleled offerings also for the oil and gas industry.

Innovative design, excellence in engineering, and maximum lifetime value are common denominators of all components, products, systems and services of the Siemens oil and gas portfolio. Combining our competence and strengths, we can together achieve the winning performance to get ahead — and stay there.

Compression and Pumping
A portfolio of field-proven gas and steam turbines, electric drives, compressors and their associated control systems including instrumentation for virtually all production, transport and process applications in the oil and gas industry.

Power Generation and Distribution
Comprehensive power solutions, including planning, finance, engineering and optimization of power grids, gas and steam turbine-based power plants, transformers, high, medium and low voltage distribution switchgears, substation automation, energy management, network consulting.

Water Management
Complete range of solutions for production field water processing, including water treatment for injection and reinjection, produced water treatment, reverse osmosis systems, flowback and pipeline services, support equipment and services.

Automation and Control
A unique array of automation and control products, systems and solutions for field, production and management levels. Designed to achieve maximum productivity while realizing substantial cost savings.

Industrial IT
Enterprise intelligence solutions for safe and reliable operation, planning and scheduling. Real-time operational intelligence, electronic procurement and trading. Process modeling, simulation and optimization; asset management.

Life-Cycle Services
A portfolio of life-cycle services, including feasibility studies, financial engineering, design and network studies as well as all levels of preventive and corrective maintenance, performance enhancement programs, service level agreements and training.

Shared Values

Building partnership through trust and expertise

Projects in the oil and gas industry are intrinsically complex — in terms of engineering, economics, health, safety and environment. In addition to technical and business expertise, trust and dedication become all-important pillars of success.

Co-operating with end-users, EPCs and OEMs alike, Siemens builds on pro-active partnerships based on mutual understanding and awareness of the special needs of the oil and gas business — its scales and risks, its speed and direction.

Whatever the primary motivation for seeking large-scale integrated solutions from a single supplier — whether the reduction of complexity, interfaces and costs, or tight start-up schedules — the Siemens oil and gas portfolio reflects a set of shared values ensuring maximum return.

Health, Safety, Environment
Siemens fosters a global health, safety and environmental culture to ensure the protection of clients, personnel and the general public. Reducing waste, emissions and discharges, and improving energy efficiency, Siemens works to continuously minimize environmental impact.

Economics
Siemens solutions are tailored to match all aspects of a customer's CAPEX, OPEX or total-cost-of-ownership model, ensuring the agreed solution provides maximum benefit at minimum cost.

Standards
Backed by decades of experience, Siemens solutions are engineered in accordance with all relevant national, international and company-specific design standards.

Quality
The strictest quality standards are an integral part of Siemens' engineering and production processes, resulting in products, systems and solutions that offer ultimate reliability, availability and lifetime value.

Siemens Solutions for Upstream

Remote operations, adverse environments, extreme climates, limited space. These are but a few of the demanding characteristics typical of oil and gas exploration and production around the globe. They translate into product requirements including extreme ruggedness, maximum availability and compact, modular designs — all of which are key features of Siemens' upstream solutions.

Onshore
Gas and liquid separation including water treatment • Recompression and export gas compression • Gathering and refrigeration compressors • Gas injection • Gas lift • Prime movers for water injection • Power supply solutions

Offshore
Platform propulsion • Ballast control systems • Gas injection • Export gas compression • Export (inventory and scheduling) management • Control and instrumentation packages for gas/oil separation • Drivers for all pumping applications including seawater injection and seawater lift • Subsea transformers • Subsea well enhancer • Crude oil storage instrumentation and control solutions • Power generation • High voltage DC power transmission from onshore • Medium voltage DC links • Power distribution solutions • Utilities (power, steam, instrument air) • Water treatment

Field Processing
Injection • Dehydration • Gas boosting • Recompression • Refrigeration • Test separators • Remote terminal units • Field data acquisition • Analyzers • Decentralized power supply • Field shelters

For all Upstream Processes
Completely integrated facility automation and control systems, including fire and gas detection systems, emergency shutdown systems, data acquisition and presentation, manufacturing execution systems (MES), and others

Current R&D Programs
Compression of associated acid gas for direct injection into reservoirs at pressures of up to 1,000 bar • Totally canned motor/compressor modules without shaft seals • Maintenance-free medium voltage subsea switchgear

Onshore
This onshore terminal near Aukra, Norway, produces natural gas from the Ormen Lange Gas Field, with recoverable reserves estimated at 400 billion cubic meters. Siemens scope of supply: switchgear, transformers; high voltage and low voltage motors and drives; integration of a comprehensive power supply package as a single source and with total engineering and interface responsibility. Photo courtesy of Norsk Hydro.

Onshore
One of 22 NAM B.V. compressor stations producing natural gas from the Groningen gas field in the Netherlands. In order to match daily and seasonal fluctuations of demand a compression solution providing a wide operating envelope was required. Siemens scope of supply: the world's first electrical high-speed variable-speed drive systems with active magnetic bearings; harmonic filter plant and all auxiliaries; fan motors for cooling banks; system integration; conceptual and detail engineering; network analysis and vibration studies.

Onshore
Saudi Aramco engaged Siemens to perform an independent engineering study to identify existing problems and to make recommendations for improvements and upgrades to the seawater filtration system. In 2005, Saudi Aramco awarded the company an order to supply an engineered solution adding 2.5 million barrels per day additional capacity to the plant. Siemens scope of supply: engineering study; seawater filtration upgrade solution, including 20 horizontal sand filters.

Offshore
The Stena Don, a semi-submersible drilling and intervention rig, operates off the coast of Norway. Siemens scope of supply: integrated control and safety system; vessel management including dynamic positioning systems; electrical systems; power generation and distribution; auxiliary and AC drilling drives; uninterruptible power supplies; communication and navigation systems; basic and detailed engineering and layout of electrical, instrumentation and telecomms systems.

Floating Production System (FPS)
The ExxonMobil-operated Falcon FPSO (Floating Production System Storage and Offloading) produces some 120,000 bbl/day of oil from the Yoho Field off the coast of West Africa. Siemens scope of supply: two SGT-100 gas turbine-powered water injection pump sets; two SGT-400 powered gas injection compressor trains and two SGT-200 generating sets; ProcessSuite and Quadlog distributed control systems (DCS); emergency shutdown system.

Floating Production System (FPS)
Petrobras' P43 and P48 produce crude oil from the Barracuda and Caratinga fields off the coast of Brazil. Siemens scope of supply: designing and manufacturing of six process packages each comprising compression trains with variable speed drive systems (VSDS), coolers, scrubbers, separators, integrated control systems, process control systems, emergency shutdown systems, fire and gas detection system, vessel management and information management system.

Siemens Solutions for Midstream

Transporting crude oil and natural gas for processing involves operating and maintaining an extensive infrastructure. Thousands of kilometers of pipelines, vast tank farms, subterranean caverns with a working gas capacity of billions of cubic meters — all powered, automated and integrated into a supervisory control and data acquisition (SCADA) system for the ultimate management of supply and demand. In addition, LNG requires an entirely different new set of solutions, from liquefaction and transportation via mega-tankers to re-gasification systems.

Pipeline
Compression and pumping with gas turbines and electric motor drives • Telecommunication systems • Remote terminal units • Station power supply • Station automation and safety systems • Leak detection • Pig and scraper tracking

Liquefied Natural Gas (LNG)
Power generation • Power transmission and distribution • Electric drive systems • Automation and safety systems • Refrigerant compression • Boil-off gas compression • Feed, flash and fuel gas compression • Re-gasification process automation

LNG Tankers
Power generation and distribution • Electric propulsion • Cargo handling system • Automation and safety systems • Boil-off gas compression

Terminal Management and Automation
Automation and safety systems • Automated loading system • Tank gauging • Distribution planning • Batch management • Product reconciliation and inventory management • Blending and re-branding facilities • Business systems integration

Underground Storage
Compression with gas turbines or electric drives • Power distribution • Automation and safety systems

Current R&D Programs
All-electric LNG and VSDS-driven refrigeration compressors of up to 100 MW • Standardized pipeline compressors • SCADA system based on common Siemens DCS hardware platform (PCS 7)

Pipeline
The Yamal pipeline supplies substantial amounts of natural gas from the West Siberian Basin to Central Europe. Siemens scope of supply: more than 20 extremely rugged, field-proven SGT-600 gas turbines.

Pipeline
A Wingas compressor station boosting European east/west natural gas transport capacities. Siemens scope of supply: compressor trains powered by innovative SGT-700 gas turbines; control systems; automation and integration up to enterprise resource planning (ERP) level.

Pipeline
Providing a main-line oil pump capacity of more than 1,700 cubic meters per hour, six of these Sonatrach-operated pumping stations keep crude oil flowing through the 840-km pipeline from Haoud El Kamra to Arzew, Algeria. Siemens scope of supply: a total of 30 SGT-200 gas turbines; system integration; SCADA system; SINAUT remote terminal units along the pipeline; fiber optic transmission system; fiber optic cable; uninterruptable power supply; passive cooling shelters; cathodic protection monitoring.

LNG
On Melkøya Island, off Hammerfest, Norway, Statoil operates the world's first all-electric LNG plant. It is designed for flawless operation at arctic temperatures and rapidly-changing operating conditions, such as fluctuating gas stocks or varying demand. Siemens scope of supply: compressors and variable-speed drive systems (VSDS) for the LNG plant; harmonic study; load commutated inverter (LCI) frequency converter units, drive control and fault diagnosis systems; transformers; containerized harmonic filters; converter cooling systems and auxiliary equipment. Photo courtesy of Statoil.

LNG
Meeting an extremely tight schedule, Siemens designed, manufactured, delivered and implemented a harmonic filter system for this LNG plant in Africa. Partnership and confidence characterized the customer relationship and were among the vital factors ensuring success of this project. Siemens scope of supply: network study for sizing and optimization of a harmonic filter system; design, manufacturing, and delivery of the harmonic filter system including reactors, resistors, capacitors and filter control; integration of the filter system into the existing electrical arrangement.

Terminal Management and Automation
Helping Saudi Aramco integrate 19 sites in the eastern, western and central regions of Saudi Arabia, Siemens' terminal management and tank farm automation system reduces both operating costs and truck movements while providing accountability and traceability for transactions and inventory tracking. Siemens scope of supply: system integration; terminal management; process automation; safety systems; preset controllers; building equipment; intercom systems; data communication infrastructure; uninterruptible power supply.

Siemens Solutions for Downstream

Encompassing the widest array of processes, oil and gas refining represents a major challenge through the sheer scale and variety of applied technologies. Economies of scale and a persistent quest for productivity gains are among the priorities for all Siemens-engineered solutions for the downstream sector.

Refinery
Compressor trains for: Fluid catalytic cracking (FCC) • Hydrocracking • Coking • Platforming • Hydrotreating • Air blower • Wet-gas • Cooker gas

Petrochemical
Compressor trains for: Crackgas • Refrigeration • Feedgas • Synthesis gas • CO_2 • Charge gas • Recycle gas • Natgas

Gas-to-Liquids (GTL)
Compressor trains for: Air separation • Syngas • Gas treatment • Refinery • Steam and gas turbine-based power plants

For all Downstream Processes
Power generation, transmission and distribution, including pre-commissioned containerized sub-stations • Completely integrated DCS including associated process instrumentation for all refining and other downstream processes • Advanced process control solutions • Integrated data visualization software enabling informed decisions on utilization of facilities and their operating efficiency • Water treatment

Current R&D Programs
Continuous development of compressor trains for petrochemical processing, refinery and air separation, meeting the growing demands of mega-scale applications

Refinery
Leuna 2000, Europe's largest refinery located in Eastern Germany, relies on Siemens compressor trains. Siemens scope of supply: six vertical geared compressors (STC-GV); two vertical single shaft compressors (STC-SV); one horizontal single shaft compressor (STC-SH); one axial single shaft compressor (STC-SX); 110 kV gas-insulated switchgear; power transformers; medium-voltage switchgear; integrated local control panels for high voltage switchgear with field level automation including substation control and protection systems as well as the redundant battery system. Photo courtesy of InfraLeuna.

Refinery
Pemex refinery at Madero, Mexico. As part of a re-configuration and extension project, Siemens was contracted as a single-source supplier for the facility's power generation, electrical and instrumentation systems. Siemens scope of supply: unique electrical and instrumentation engineering for the whole plant; integrated information system; DCS including advanced process control; emergency shutdown system; fire and gas detection system; SCADA system; field instruments; tank gauging system; power generation 2 x 32 MW; HV, MV, and LV switchgear; lighting and grounding systems.

Refinery
Based on extensive positive experience with Siemens products, Siemens was asked to supply and install a state-of-the-art DCS at Shell's refinery in Heide, Germany. The solution had to interface with a variety of other systems, including AspenTech IPX (APC), Refinery Information System IRIS, SAP, and SIGRAPH EMR. Siemens scope of supply: PCS 7 system including 9+25 controllers, 3 redundant OS servers, 7 standard clients, 11 single user stations, one large display wall, and 3 engineering systems.

Refinery
ConocoPhillips Humber refinery in the UK, upgrade and optimization. Siemens scope of supply: 7 substations with protection and control; 11kV Korndorffer starters; substation automation solution with SICAM equipment; 8 power transformers; 4 factory assembled and pre-commissioned containerized substations (E-Houses). Photo courtesy of ConocoPhillips.

Olefins
At their Port Arthur, Texas/USA mega olefin plant, BASF FINA Petrochemicals Limited Partnership operate one of the world's largest naphta steam crackers. Siemens scope of supply: five STC-SH horizontally split single shaft compressors (one cracked gas compressor train with three casings, one propylene compressor, one compressor for ethylene), all powered by Siemens steam turbines SST-600; two STC-SV vertically split single shaft compressors (one methane compressor, one hydrogen recycle gas compressor), with electric drives. Photo courtesy of BASF.

Gas-to-Liquids (GTL), Coal-to-Liquids (CTL)
Proving technical feasibility and the economies of scale required from commercially viable GTL/CTL front-end technology, this electric motor driven compressor delivers approx. 700,000 cbm/h of air to the air separation unit at SASOL's Secunda CTL plant near Johannesburg, South Africa, the largest of its kind worldwide. Siemens scope of supply: STC-SR very-high-volume main-air compressor; system integration; distributed redundant SCADA system; integrated leak detection and batch tracking; integration of various subsystems; fiscal metering systems; automation of pump stations with fault-tolerant programmable logic controllers (PLC); pump surge protection.