

A worker in an orange protective suit, yellow hard hat, and safety glasses is operating a large industrial valve on an oil pumpjack. The background shows a clear blue sky with scattered white clouds. The VACON logo is positioned in the upper right corner.

VACON[®]
DRIVEN BY DRIVES

A decorative graphic consisting of multiple thin, parallel blue lines that curve and flow across the page, separating the top image from the bottom text.

VACON[®] AC DRIVES SOLUTIONS
OIL PUMPING



ADD NEW DRIVE TO YOUR OIL & GAS APPLICATION

Most of the processes within the oil and gas industry are complex and exposed to harsh environmental conditions, placing a high demand on the process equipment. Additionally, the need to reduce lifting costs and optimize production is critical. Achieving a high level of equipment efficiency and availability translates directly into bottom-line benefits: increased production output and improved product quality.

Using state-of-the-art VACON® AC drives will provide energy savings to any process in this field through effective speed control. These drives are also rapidly replacing the less efficient variable-speed mechanical devices in oil pumping.

OPTIMIZE PUMPING SPEED, CONTROL COSTS

Over 60% of functioning oil wells require some kind of assisted lifting technology to recover the retrievable oil. In onshore wells alone, there are huge energy savings to be gained by using AC drives in progressive cavity pumps (PCP), electric submersible pumps (ESP), beam pumps, reciprocating pumps and centrifugal pumps. VACON AC drives are particularly well suited for heavy usage, from fluid flow control in PCP and beam pumps to customized pumping applications. AC drives are also used in the high-pressure systems used for enhanced oil recovery in mature wells.

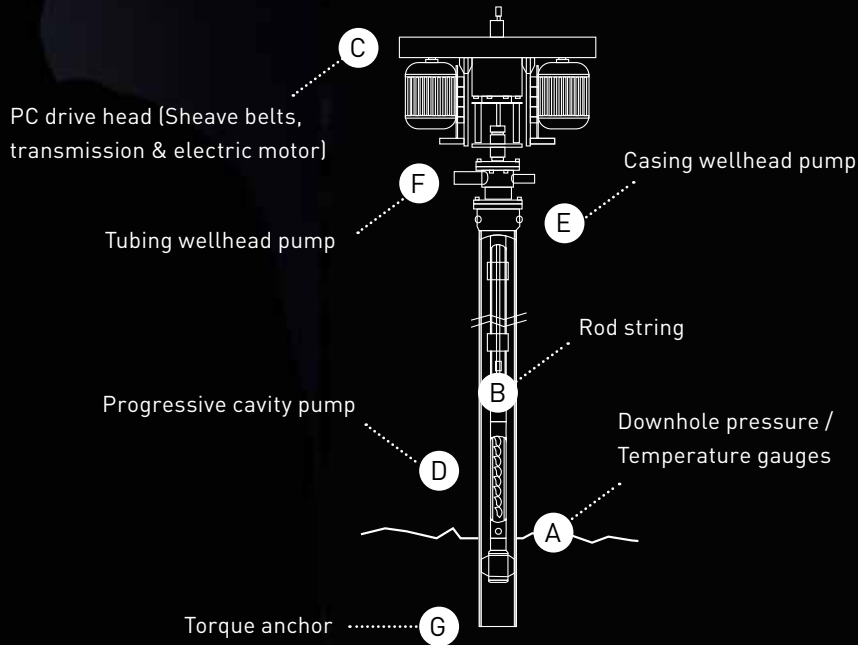
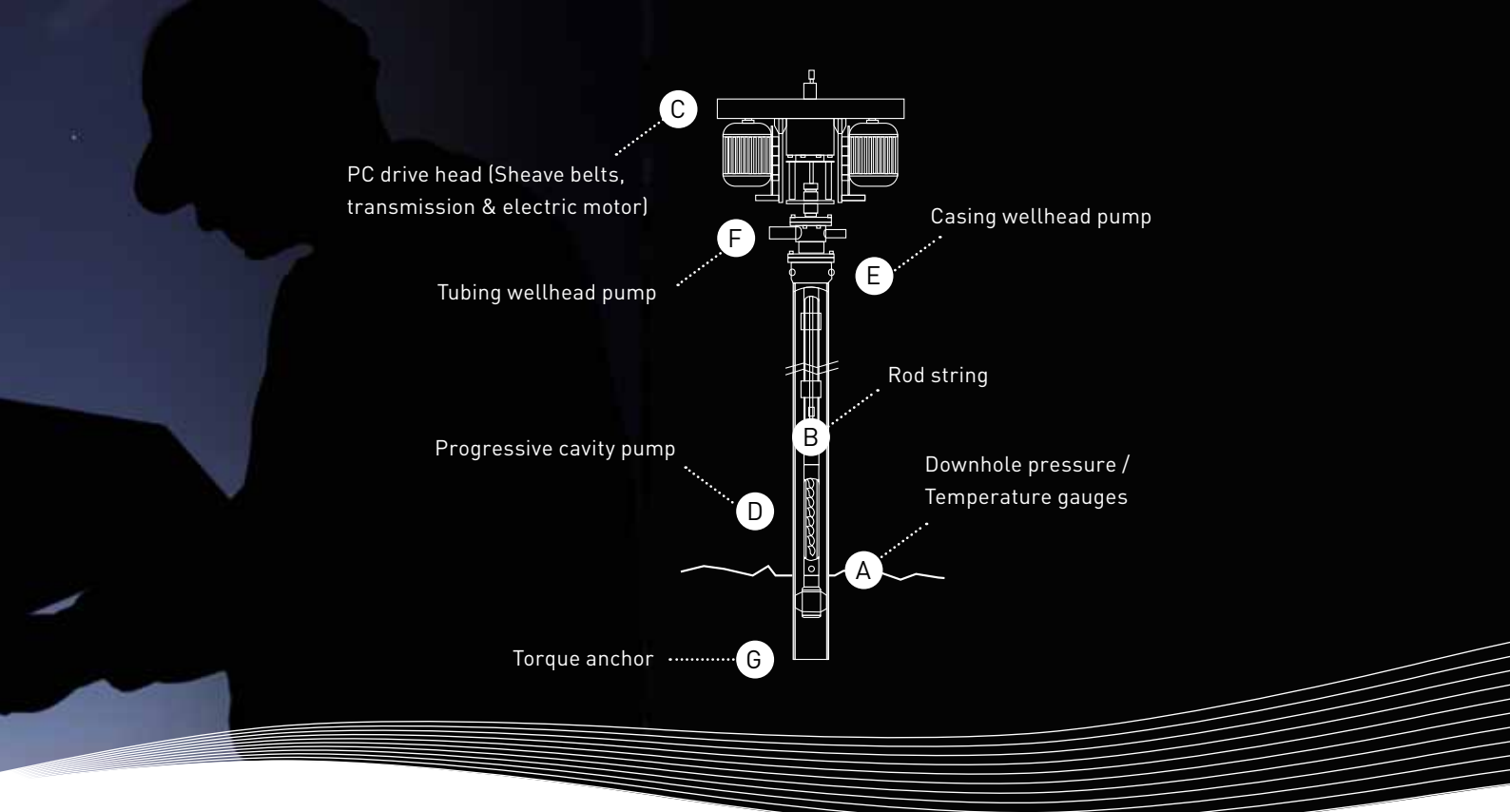
THE VACON APPROACH

VACON AC drives are specifically designed for the harsh conditions encountered in oil field production, where compressors and pumps may not always operate at their optimal working level.

Vacon supplies low voltage AC drives from 0.25 kW to over 5 MW and has one common platform for all sizes, which means that the use and programming of different sized drives is the same. The spares are also, to a large extent, common throughout the range. Vacon offers both air-cooled or liquid-cooled drives for different power and voltage requirements. Investing in highly efficient, largely maintenance-free AC drives will help control costs. This is particularly important for the oil and gas industries, where the need to optimize production, save energy and minimize environmental impact has never been more critical. Another great reason to improve application processes using AC drives is the greater degree of safety it offers. The improved motor control dramatically reduces the likelihood of onsite accidents, such as belt breaks or mechanical malfunctions.

BOTTOM-LINE BENEFITS

- Reduced mechanical stress leads to lowered maintenance costs
- Reduced energy consumption due to optimum pumping
- Minimized accumulation of solids
- Increased pumping capacity
- Dedicated 24/7 service solutions
- Electrical disturbances eliminated with harmonic RFI/EMI filtering



VACON SOLUTION FOR PCP APPLICATIONS

Given their low capital and service costs, PCP systems have traditionally been used in low volume applications. New technologies now allow PCPs to extend their application range to high volume wells, which require higher torque and power. The relatively high cost of operation means that the system must be optimized and protected to extend the equipment's lifespan and improve overall cost efficiency.

At present, most of the PCP systems around the world are controlled by surface parameter interpretation (torque, speed, flow rate). There is a real need to identify bottom hole pressures and temperatures, as well as to provide reliable, low-cost remote control systems in order to minimize operating costs. VACON® NXP drives can indirectly estimate these variables which should, in turn, help users in identifying the state of their well.



VACON® NXP (FR10)



VACON® NXP (FR8)

FEATURES

- Control and protection of the rod torque
- Speed control and torque control using measured signals such as suction pressure, discharge pressure and discharge temperature
- Protection for low and overload situations, high motor temperature, low and over-torque, etc.
- Speed control with torque limitation based on motor and system protection, fluid level, etc.
- Direct configuration of pulley ratio
- Monitoring of system pressures, suction pressure, discharge pressure and discharge temperature
- Backspin Control with DC Brake
- Backspin Control at a power loss and operation under phase loss conditions

BENEFITS

- The motor speed can be adjusted according to the flow from the oil well which means that the oil can be pumped continuously
- Settling of solids and/or accumulation of paraffins and cavitation is minimal
- Maintenance, servicing and energy costs are reduced, and the pumping system is significantly more reliable.



VACON SOLUTION FOR BEAM PUMP APPLICATIONS

Our Beam Pump Application is used to maintain a constant stroke time (measured in strokes per minute or 'SPM') by adjusting the internal frequency reference. The control principle is to provide a proper current limit for normal operation so that during the motoring cycle, the actual speed is less than the reference speed, and during the generating cycle, the motor speed may exceed the reference speed while keeping the average SPM constant. With a balanced load, the application utilizes two different references for downstroke and upstroke.

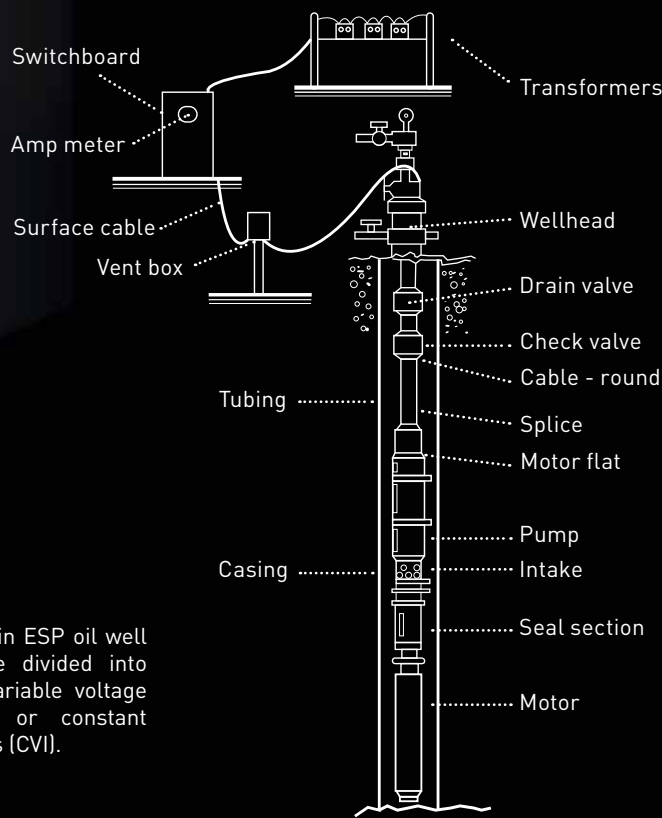


FEATURES

- Engineering Process data variables available
- Pump speed (SPM) is directly set on the drive parameters
- Sensorless operation/bridle separation control
- Operation without braking resistor
- Independent up and down stroke speeds to maximize pump fill
- Pump Off control with restart timer and programmable delay at automatic restart.
- No load cell to calibrate
- Continuously computes pump fill
- Accurate pumping unit counter balance program
- RTU and ANSI communication protocol included

BENEFITS

- Eliminates excessive rod force
- Decreased power consumption
- Dynamic braking without external resistor for accurate speed control
- Minimizes equipment wear
- Maximum torque at zero speed means no need for high slip motors
- Premium efficiency motors ensures easy load starting



AC drives used in ESP oil well applications are divided into 2 categories: variable voltage inverters (VVI) or constant voltage inverters (CVI).

VACON SOLUTION FOR ESP APPLICATIONS

About 15 to 20 percent of almost one million wells worldwide use some form of artificial lift employing Electric Submersible Pumps (ESPs), which is the fastest growing form of artificial lift pumping technology.

ESPs are often considered the best among oil field lift systems when high volume and depth is a factor. They are especially effective in wells with low bottom hole pressure, low gas/oil ration, low bubblepoint, high water cut or with low API gravity fluids.

On a cost-per-barrel basis, ESPs are generally economical, efficient and versatile. With only the wellhead and fixed- or variable-speed controller visible at the surface, ESP systems offer a small footprint and low-profile option for virtually all applications, including offshore installations.

Vacon's solution for controlling the operation of an ESP ensures that the motor will operate continuously in the case of power disturbances. Our ESP application includes a step up transformer in order to supply sufficient voltage to the motor.

FEATURES

- Backspin control with DC brake during power loss
- Power optimization during phase loss operation
- Integrated sine filter to step-up transformers
- No need for non-return valve on the system

BENEFITS

- In a blackout condition, the AC drive uses the regenerative energy to control the backspin
- In a brownout condition, a power dip controller weakens the motor field to maximize pump production, making it consistent with reduced input power availability.
- In a phase loss or voltage imbalance condition, a phase loss controller reduces motor output to keep drive system output power at, or below, single phase capacity.

DID YOU KNOW?

A pump running at half speed can consume as little as one eighth of the power compared to one running at full speed. A small reduction in operational speed through the use of AC drives can lead to huge energy savings.

VACON SOLUTION FOR CUSTOMIZED PUMPING APPLICATIONS

Vacon's strength is in our ability to provide customized solutions and immediate installation support globally. In South America, for example, Vacon has partnered with Inpegas to offer local customers a comprehensive system for petroleum applications for both PCP and mechanical pumping systems (beam pump or swing). This integrated solution comprises a VACON® NXO with a

data logger and is housed in durable cabinets for PCP or beam pumping applications. Likewise, we've partnered with PWR Lifting, a Brazilian manufacturer of artificial lift systems for oil, to provide customized AC drive enclosed solutions for local customers.

Contact your local representative for further information.

DATA LOGGER FEATURES

- The logger is a data recorder designed to record measurements from VACON PETRO-TRAC system
- This device communicates with the drive via Modbus and displays scheduled events and failures in code and data in plain text (English, Spanish and Portuguese)
- It allows operational data storage VFD data. All data on the VFD display option can be recorded on the logger.
- Also stores events in the computer
- Saves data and allows downloads via USB and operational value of VFD monitoring
- Setting the start date and name of the well
- Real-time values and status monitoring
- Monitoring and recording of historical events
- Graphics and drive parameter changes under development
- Data logged available in Excel or compatible database

CABINET FEATURES

- IP56/Type 3R enclosure with double door and anti vandal protection
- VACON NXP frequency converter
- Drive and protection systems
- Main breaker, Input fuse protection
- MOV or TVSS on request
- 3 phases surge protection content on request
- Integrated harmonic filter on request
- Data logger

COMBINED BENEFITS

- Lower maintenance costs due to reduced mechanical stress
- Reduced energy consumption due to optimum pumping
- More reliable operation because of minimized accumulation of solids
- Pumping capacity increased
- Easy well protection



“ PWR is very pleased to partner with Vacon in South America given the excellent quality of its equipment, consistent cost-benefit ratio and outstanding technical support provided before, during and after installation.

Eduardo Bastos, General Manager, PWR Lifting Petróleo Ltda.



TECHNICAL DATA

Drive Code	Rated Power		Nominal Current I _n	Voltage	IP class	Nominal Frequency	Cooling	Cabinet enclosure
	HP	kW	A					
NX000165A6H1SSSA9A2B400C2	10	7.5	16	440V	Nema 3R	45...66Hz	Air Cooled for outdoor use	1
NX000225A6H1SSSA9A2B400C2	12.5	9.2	23					1
NX000315A6H1SSSA9A2B400C2	15	11	31					1
NX000385A6H1SSSA9A2B400C2	25	18.5	38					1
NX000455A6H1SSSA9A2B400C2	30	22	45					1
NX000615A6H1SSSA9A2B400C2	40	30	61					1
NX000725A6H0SSSA9A2B400C2	50	36	72					2
NX000875A6H0SSSA9A2B400C2	60	45	87					2
NX001055A6H0SSSA9A2B400C2	75	55	105					2
NX001405A6H0SSSA9A2B400C2	100	75	140					2
NX001685A6H0SSSA9A2B400C2	125	90	168					2
NX002055A6H0SSSA9A2B400C2	150	110	205					2
NX002615A6H0SSFA9A2B400C2	175	125	261					3
NX003005A6H0SSFA9A2B400C2	200	145	300					3
NX003855A6L0SSAA9A2B400C2	250	185	385					3
NX004605A6L0SSAA9A2B400C2	300	220	460					3
NX005205A6L0SSAA9A2B400C2	400	300	520					3

TYPE CODE KEY

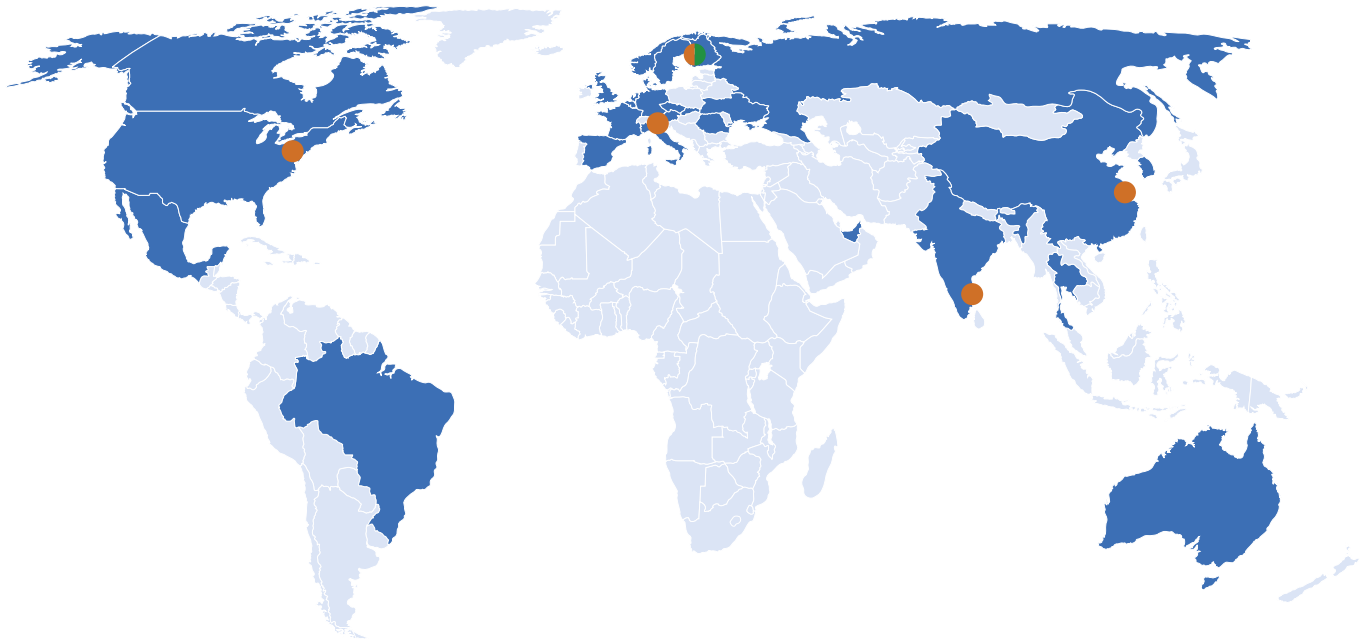
NXO 0520 5 A 6 L 0 S SA A9 A2 B4 00 C2 + OPTION CODES

NXO	—	NXP Drive in a cabinet
0520	—	0520 = 520 A
5	—	5 = 380... 500V; rated power calculated to 440V
A	—	A = Standard keypad; B = No keypad; G = Graphical keypad
6	—	6 = Type 3R Enclosure class
L	—	L = Fulfills standard EN61800-3, 2 environment
0	—	0 = No break chopper; 1 = break chopper availability
S	—	S = Standard AC Drive
SA	—	S = Standard Cooling System
A9	—	A/F = Standard Boards; B/G = Varnished Boards
A2	—	Standard I/O
B4	—	Standard Relay Output
00	—	Extended I/O
C2	—	Modbus Communication, OPT-CI as an optional
+		
OPTION CODES	—	+ OSI + Sinus Filter
		+ PCP + Special SW for Progressive Cavaty Pump
		+ ESP + Special SW for Electrical Submersible Pump
		+ HPS + Special SW for High Pressure Systems
		+ BP + Special SW for Beam Pump

VACON AT YOUR SERVICE

Vacon is driven by a passion to develop, manufacture and sell the best AC drives and inverters in the world — and to provide customers with efficient product life-cycle services. Our AC drives offer optimum process control and energy efficiency for electric motors. Vacon inverters play a key role when energy is produced from renewable sources. Vacon has production and R&D facilities in Europe, Asia and North America, and sales and service operations in nearly 90 countries. In 2011, Vacon's revenues amounted to EUR 380.9 million, and the company employed globally approximately 1,500 people. The shares of Vacon Plc (VAC1V) are quoted on the main list of the Helsinki stock exchange (NASDAQ OMX Helsinki).

VACON — TRULY GLOBAL



● Production and R&D ● Vacon PLC ■ Vacon own sales offices ■ Served by Vacon partner

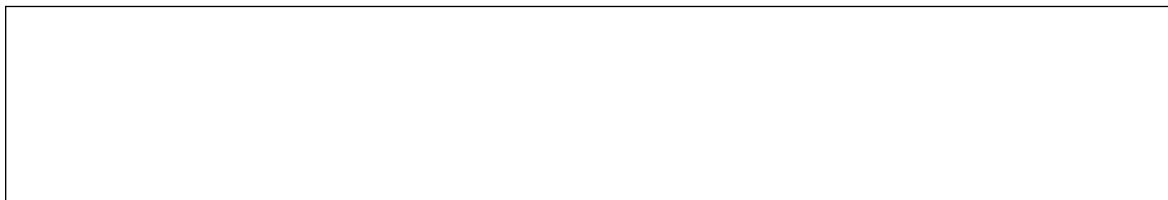
MANUFACTURING
and R&D on 3 continents

VACON SALES & SERVICE
in nearly 30 countries

SALES & SERVICE PARTNERS
in 90 countries

VACON[®]
DRIVEN BY DRIVES

Vacon partner



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