

ACE



Variable Speed Drive For Progressing Cavity Pump



APPLICATIONS

Progressing cavity pump (PCP) installations in

- ♦ Heavy, medium, and light oil wells
- ♦ Waters wells
- ♦ Coalbed methane and conventional gas wells (for dewatering)
- ♦ High-water-cut and high-sand-cut environments
- ♦ Thermal applications
- ♦ Horizontal, deviated, and vertical wells

BENEFITS

- ♦ Lower energy consumption and operational costs
- ♦ Extended PCP run life
- ♦ Enhanced safety

FEATURES

- ♦ ABB's mature frequency control technology
- ♦ Torque limiting
- ♦ Auto-restart after power loss
- ♦ Local data logging
- ♦ Design for harsh environment
- ♦ Low harmonics design
- ♦ Handle regenerative energy with brake chopper and resistors
- ♦ Backspin control helps protect the pump and people
- ♦ Instrumentation-free speed and torque control
- ♦ Pump overheating protection
- ♦ Overpressure protection eliminates the need for manual restarts
- ♦ Optimized fluid level and production rates
- ♦ Application-specific acceleration ramps provide low-stress, smooth starting
- ♦ System supervision



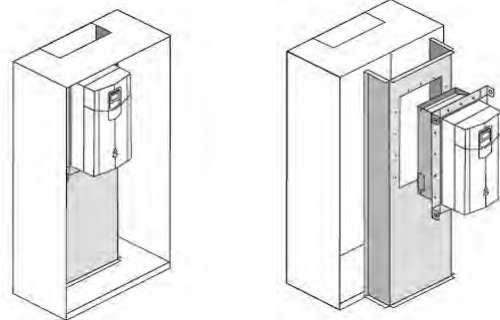
The high performance Variable Speed Drive (VSD) enable sophisticated motor control with speed and torque accuracy, low harmonics, and smooth speed ramping, thereby maximizing motor performance. The system enhances safety through controlled stopping and braking, limiting of maximum speed, and direction management. The VSDs are available for all major voltage levels and both 50Hz and 60Hz.

DRIVE MODULE

The drive module integrated in IP55 enclosure is ABB ACS880 series product with characteristics as below:

Flange (push through) mounting

- ♦ Flange mounting is designed for outdoor cabinet and harsh environment installations where dust and other impurities are present. In flange mounting, the drive is installed from a flange onto a cabinet internal wall so that the heatsink is outside the electrical components section, and the air flow through the drive control section and heatsink are separated. The flange and heatsink are protected against dust and low-pressure water with IP55 class protection, making the installation suitable for harsh environments.
- ♦ For the outdoor type VSD cabinet, the control section of ABB drive module is sealed in the electrical components area, this part can be sealed in IP65 or IP55 enclosure. With the reduced need for cooling air, smaller fans or heat exchanger units can be used. Flange mounting simplifies cabinet design and helps to build robust cabinets with smaller installation footprints and lower investment costs.
- ♦ The drive can be installed with the heatsink in a cooling air channel to direct the majority of the heat generated by the drive out of the electrical components section. Investments in air-conditioning systems and their operating costs are cut, as the need for cooling is substantially reduced.
- ♦ Since the heat generation inside the electrical components section is low, smaller air circulation inlets, outlets and associated filters can be used. Reduced air circulation results in longer filter maintenance intervals.



Built-in control software

ABB ACS800 drives include a built-in control software that is designed specifically for progressing cavity pumps (PCP). This control software provides several features such as backspin control, pressure protection, level control and acceleration ramps that improve the production and help protect the pumping system.

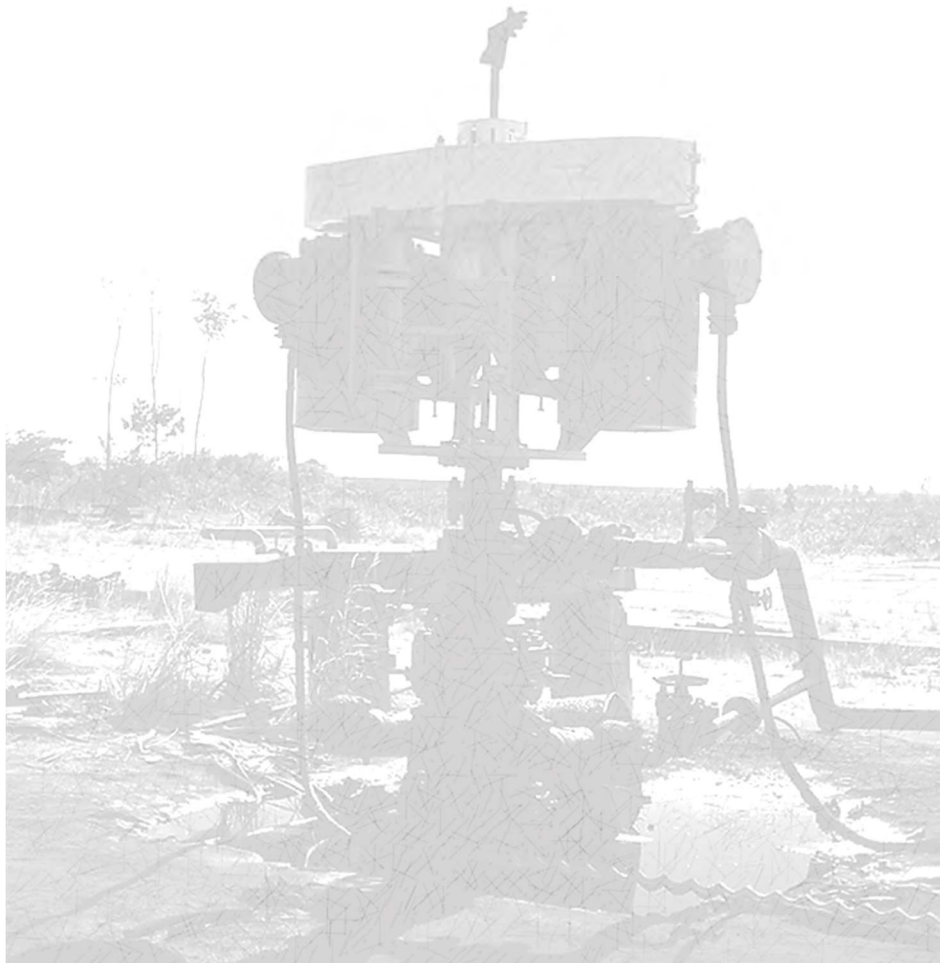
INPUT LOW HARMONIC

- There is a built-in Passive Harmonic Filter for low harmonic requirement. The Passive Harmonic Filter represents an economical solution to the challenge of load-applied harmonics mitigation in three-phase power systems. It increases the reliability and service life of electric installations, help utilize electric system capacity better, and it is the key to meet Power Quality standard such as IEEE 519. Passive Harmonic Filter reshapes distorted current back to the desired sinusoidal waveform. It can be applied to virtually and kind of power electronics with front-end 6-Pulse rectifier, 3-phase diode or thyristor bridges, where harmonic current distortion needs to be reduced to defined limits.
- External Active Filter is option.

EXCELLENT CONTROL FUNCTIONS

Variable Speed Drive (VSD) control program:

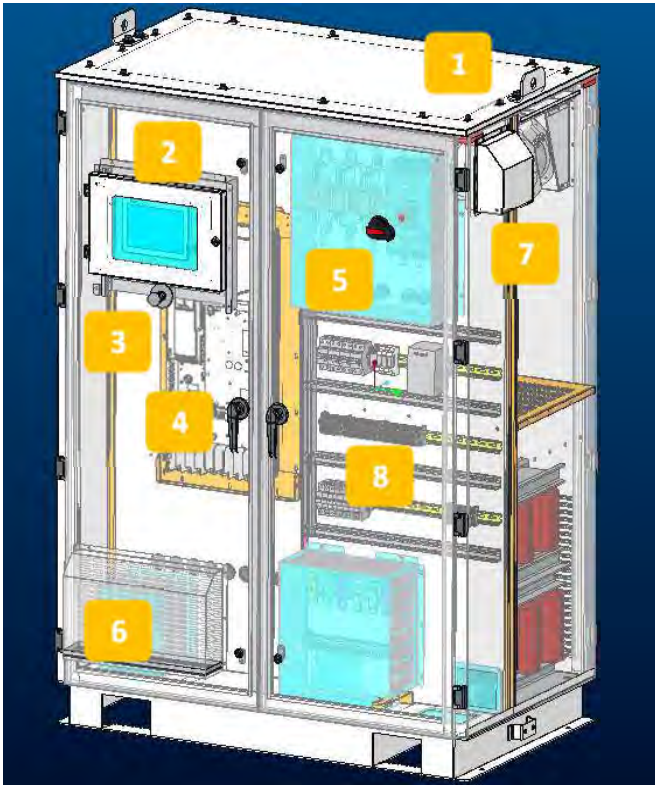
- Includes several process control functions to protect the pump equipment and optimize the production
- Protection based on values calculated by the VSD and measure values
- Optimization through automatic speed adjustments
- PCP is run in DTC mode.



VARIABLE SPEED DRIVE SPECIFICATIONS

Enclosure and Environment		VSD Functions (Application Software)	
Enclosure rating	IP55, conforming of IEC60529	Startup ramp	Own ramp time to reach start up reference
Enclosure frame	The main frame adopts full welding instead of bolt fixation	Automatic restart	Restart the PCP in case voltage dip or power failure with adjustable delay timer
Cooling method	Air-forced cooling with fans	Forward/reverse	Reverse the motor rotation at HMI
Altitude	0 to 1000m without derating; 1000m to 4000m with derating of 1%/100m	Pump level control	<ul style="list-style-type: none"> PI based regulator which keep the level at the user given set point. Speed of the rod is automatically adjusted. Actual level information (e.g. depth or pressure) can come from one or several sensors
Storage temperature	-40°C to 70°C		
Operating temperature	-30°C to 50°C		
Relative humidity	5% to 95%, noncondensing allowed		
H ₂ S protection	Conformed-coated circuit boards and tin-plated bus bars	Sleep and wakeup	<ul style="list-style-type: none"> Reduced energy consumption because pump is activated only when needed Pump is automatically stopped when fluid level goes below sleep level
Enclosure material	Carbon steel and the thickness is 2mm	Pump pressure protection	<ul style="list-style-type: none"> Pump will be stopped in case of high pressure or high discharge pressure Pressure measurement via analog or digital inputs
Paint color	RAL9010		
Cable inlet and outlet	From bottom of VSD	Pump torque protection	<ul style="list-style-type: none"> Rod is protected from overload and/or underload conditions In case of excess load condition the speed is automatically changed or VSD is stopped
Installation	Anchor bolts for bottom installation		
VSD lifting method	lifting lugs on the top of VSD enclosure		
Principal Control Parameters			
Motor control	Direct Torque Control (DTC)	Pump underload protection	<ul style="list-style-type: none"> In case rod torque is below the user defined curve a fault or warning is created Can happen e.g. when there is fluid with gas, lack of fluid or the rod is broken This function also enables pump protection with motor current
Control object	Single motor or double motors		
Motor type	Asynchronous Motor or PMM		
Input voltage	3 phase 380V to 500V ±10%		
Input frequency	50Hz/60Hz ±5%	Pump temperature protection	<ul style="list-style-type: none"> Protect pump from overheating Temperature measurement from analog or digital sensor. Both can be used simultaneously
Output voltage regulation	Same as power supply		
Output frequency	0 to ±598Hz	Backspin control	<ul style="list-style-type: none"> Prevents the unit from uncontrolled reverse caused by fluid back flow in the well A redundant and safe way to stop the pump rotation in case mechanical brake fails (or do not exist)
Inverter efficiency	≥98%		
Inverter section	IGBT	Protection function	<ul style="list-style-type: none"> Short circuit protection Phase unbalance/single phasing protection Earth fault protection Over speed protection Over current protection Over torque protection (torque limit) Over voltage protection Under voltage protection Power loss ride-through
Power factor	0.98 at rated load		
Torque control	Torque step rise time: <5ms with nominal torque Non-linearity:±4% with nominal torque		
Speed control	Static accuracy: 10% of motor nominal slip Dynamic accuracy: 0.3% to 0.4% seconds with 100% torque step		
Overload capacity	150% of the rated current for 1 minute	VSD commissioning	The ABB drive module control panel can communicate to a PC by Drive Composer
Input configuration	Diode 6 pulse		
Input low harmonic	The VSD is supplied with Passive Harmonic Filter, and active filter is option	Inputs and outputs	<ul style="list-style-type: none"> 4 analog inputs and 2 analog outputs 6 digital inputs and 2 digital outputs 3 relay outputs The inputs and outputs are expandable
Handle regenerative energy	Integrated brake chopper and brake resistors		
Data Display and Storage			
Device	7" touched screen panel, 10 language available		
Basic information	VSD model, date of manufacture, default, date	Data storage	Download to hard disk by USB port
Down-hole data	The VSD is provided with facility to integrated with down-hole sensor and display/store the sensor data within the HMI		
PCP system data	Power supply voltage, current and frequency		
	VSD output voltage, current and frequency		
Data transmission	Motor load, voltage, speed, torque etc.	Communication	2 × RS485 2 × Ethernet 1 × USB port
	Protection alarms and trips. All fault message and operating condition are presented in text.		
	The data is displayed in graphical and tabular format on HMI		

VARIABLE SPEED DRIVE DESCRIPTION



1	Lifting lugs on the top of VSD enclosure
2	7" touched screen panel with protective cover
3	Emergency stop button
4	ABB drive module electrical components part
5	Main breaker and extend handle
6	Air inlet of electrical components section
7	Air outlet of electrical components section
8	Control devices e.g., MCCB, SPD, Space Heater, Relay...etc.



9	Cooling fans for "dirty area"
10	Capacitors of passive harmonic filter
11	Reactors of passive harmonic filter
12	Control transformer
13	ABB drive module heatsink section
14	Brake resistors
15	Air-inlet of "dirty area"

VSD for Progressing Cavity Pump

VSD Data sheet

VSD rating, HP [kW]	75 [55]	100 [75]	150 [110]	200 [160]
Output current A@480V/60Hz	96	124	180	302
Dimension HxWxD [mm]	1800x1300x800	1800x1300x800	1800x1300x800	1800x1300x800
Approximate weight [kg]	722	756	785	824

