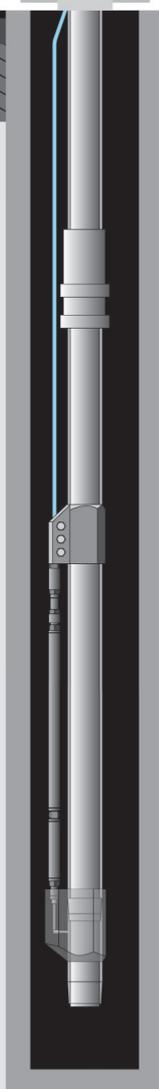# Variable frequency drive for sucker rod pumps

IRZ-400 series

VFD for Sucker Rod Pumps

IRZ-400 series VFDs ensure control, parameters monitoring, protection and rotation frequency regulation of rod pumps.

Generation, display, and analysis of calculated dynamometer cards

The main feature of the smart VFD is that the user can build up a **calculated dynamometer card** without using a load cell or other sensors to be mounted on moving parts of the pump system.

With the help of VFD, the user can **CONSTANTLY MONITOR** the operation of the pumping equipment, as well as pump fill factor and well production rate.
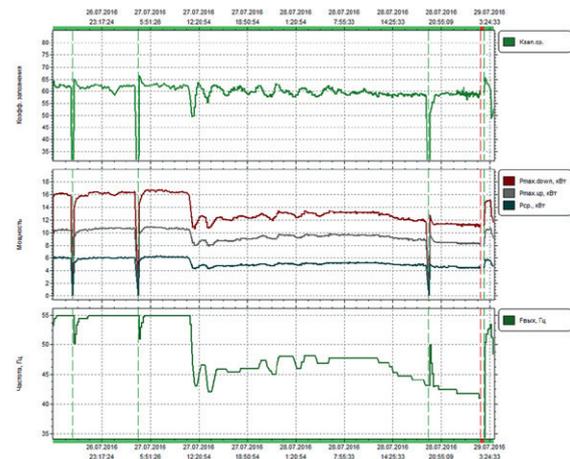
Adjustable graphic presentation of parameters on the drive's display or a PC
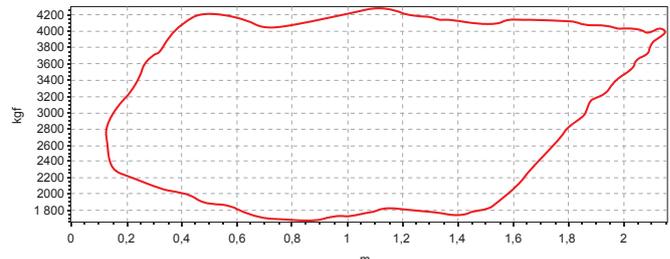
Load curve drawing without a load cell

Effect

- Maximizing well production rate due to:
  - smart control algorithms
  - minimization of emergency shutdowns

- Increase of time between overhauls by means of diagnostics and protection of subsurface pump equipment

- Reduction of maintenance costs due to:
  - change of SPM without replacing the pulleys
  - automatic selection of pump operation mode
  - continuous automatic control of dynamometer cards

- Energy saving up to 40% due to:
  - elimination of the generator mode
  - SPM optimization
  - stop/slow-down in case of pump-off and other emergencies

- Continuous automated real-time analysis allowing registering work parameters and detecting potential causes of loss of efficiency

Technical specification

Parameter	Value
Supply voltage	285 ... 475 V ($380^{+25\%}_{-25\%}$ V) 340 ... 550 V ($480^{+15\%}_{-30\%}$ V)
Power range of electric motor to be connected	45-320 h.p.
Range of regulated rotation frequencies	0.5-100 Hz (resolution 0.1)
Enclosure protection class	IP43, IP54 or higher at request
Operating temperatures	-60 ... +60 °C

Features

- Smart control algorithms for automatic well production optimization
- Service modes for variety of production scenarios
- RS232/RS485 interfaces
- Digital & analog inputs
- Compatible with SCADA systems
- Radio link for data transmission (GPRS)
- Graphic screen
- Colored light indicators
- History download to a USB drive
- Software update without motor shutdown using a USB drive
- Data retention in case of power interruptions
- Easy setup, quick start menu
- Reduction of plunger damage caused by fluid impacts
- Capability to regulate beam up & down motion at different speeds

Functions

- Monitoring pump system parameters:
  – Measuring pump fill, flow rate (at any moment of pump operation), downhole and ground equipment loads, voltage and current imbalances, load factor, power factor, power consumption, and failure free operation time
  – Taking and analysis of surface and in-depth dynamometer cards
- Automatic control of well operation based on:
  – pump fill
  – operation timer
  – well operation schedule
  – two-term (proportional-differential) controller (to maintain constant pump fill)
- Pump-off control
- Smooth start/stop and regulation of motor rotation frequency
- Automatic restart
- Data display

Protections

- **Protection in case of faults in the pump system:**
  – Pump off
  – Belt and rod breakage
  – Current overload/underload in any phase
  – Phase currents imbalance
  – Unallowable well-head pressure
  – Short circuit
  – Abnormal parameters reported by the DH monitoring system

- **Protection in case of faults in the power supply system:**
  – Overvoltage
  – Low voltage
  – Phase voltages imbalance
  – Incorrect phase sequence

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