Oil & Gas

BONITRON

Beam Pumps
Drawworks
Electrical Submersible Pumps
Progressive Cavity Pumps
Pumpjacks
Rotary Tables
Top Drives
+ More!

Why Bonitron?

- Decades of proven success in the oil industry
- Quick delivery and support
- Maximize uptime to increase ROI
- Strong reputation for quality

Products

Braking Resistors
Braking Transistors
Common Bus Power Supplies
Single Phase Line Regeneration
3-Phase Line Regeneration
Uninterruptible Power for Drives

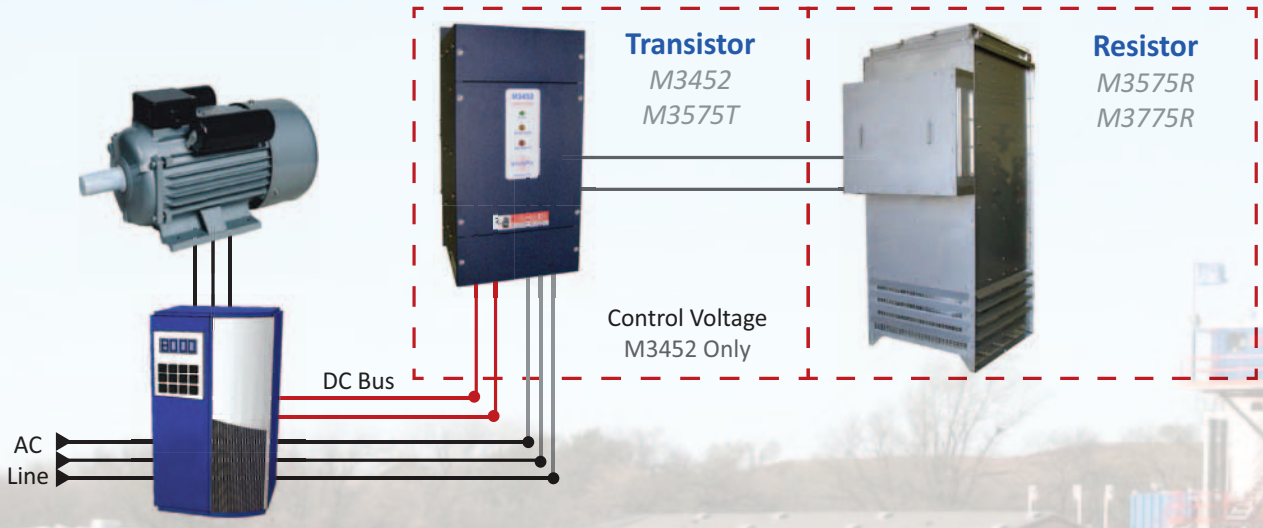
On-Shore

Draw-works / Rotary Table / Top Drive

Draw-works and Top Drive/Rotary Table drilling rigs drill holes into the earth in order to extract petroleum. Most of these rigs utilize variable frequency drives (VFDs) to control the AC motors that raise and lower the travelling block (done via draw-works), as well as the spinning of the drill bit (done via top drive or rotary table).

Time is money in the oil industry. The faster the draw-works lowers (referred to as "tripping in") the drill string back into the borehole after adding an extension, the better. The drill string is dropped and then slowed rapidly before coming to a stop. This rapid deceleration produces regenerative energy from the AC motors and requires drive overvoltage protection, commonly in the form of a Braking Transistor and Resistor.

A Top Drive or Rotary Table spins the drill string. Drill strings can be thousands of feet in length, so it is common for one end of the string to be spinning faster or slower than the other end (just as if you were to spin on end of a shoe string). Overvoltage protection on the top drive or rotary table is necessary in these cases to control torque on the drill string.



Bonitron Solutions

Braking Transistor

- M3452 or M3575T
- Up to 1600A per unit (Master/Slave Capable)
- Local and remote status monitoring
- System can be reconfigured on-the-fly

Resistive Load Banks

- M3575R or M3775R
- Ratings up to MegaWatts
- Galvanized steel enclosure
- NEMA-3R and stainless steel options

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615-244-2825
info@bonitron.com

On-Shore

Draw-works

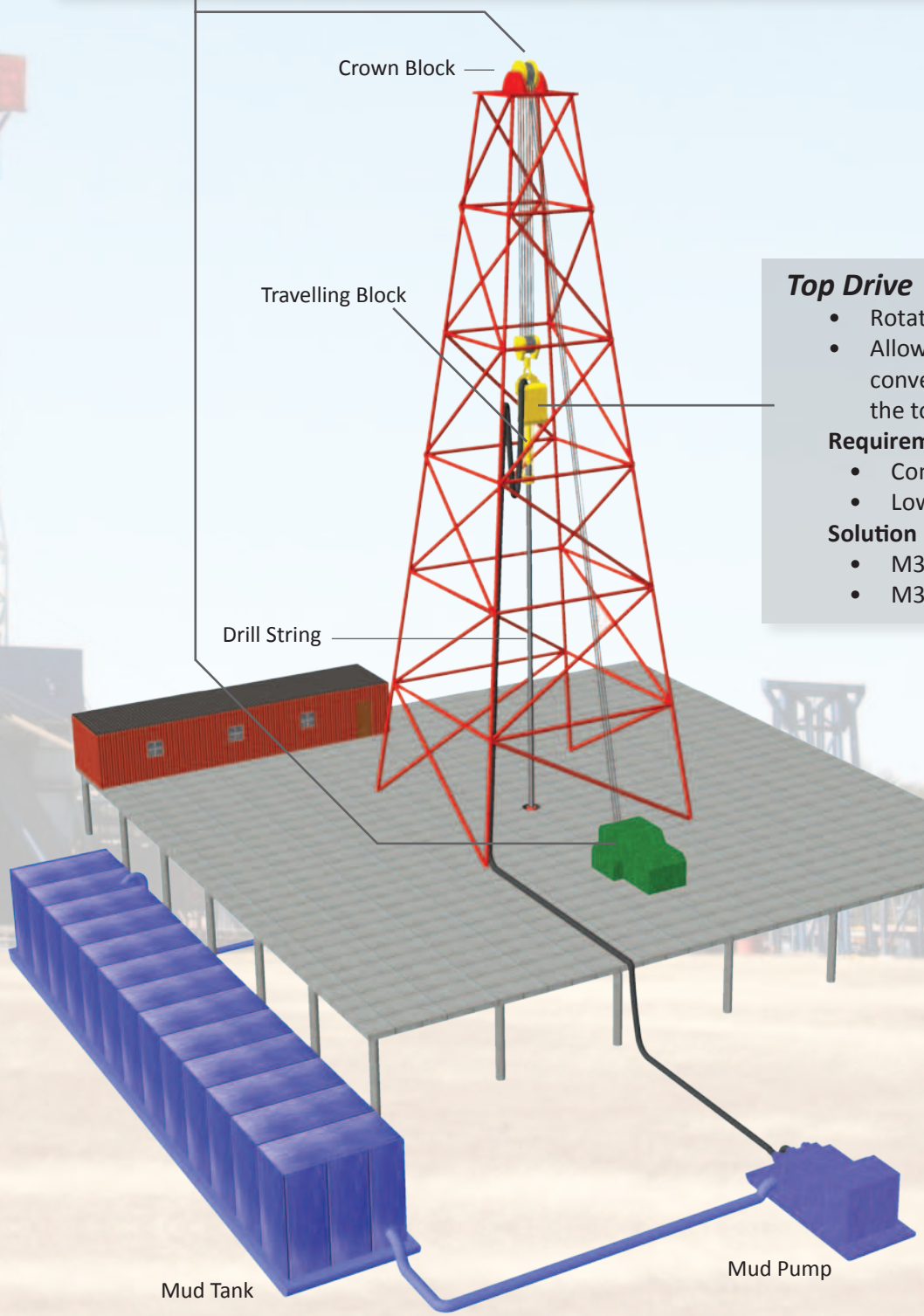
- Raises and lowers traveling block
- Lowers string into borehole as fast as possible without hitting drill bit at the bottom
- Stops the heavy drill string quickly (requiring overvoltage protection)

Requirement

- HIGH peak power
- Low duty cycle braking

Solution

- M3452 Heavy Duty Braking Transistor
- M3775R Resistive Load Bank



Top Drive

- Rotates the drill string
- Allows longer drill string sections than conventional rotary table style rigs, as the top drive can move up the rig

Requirement

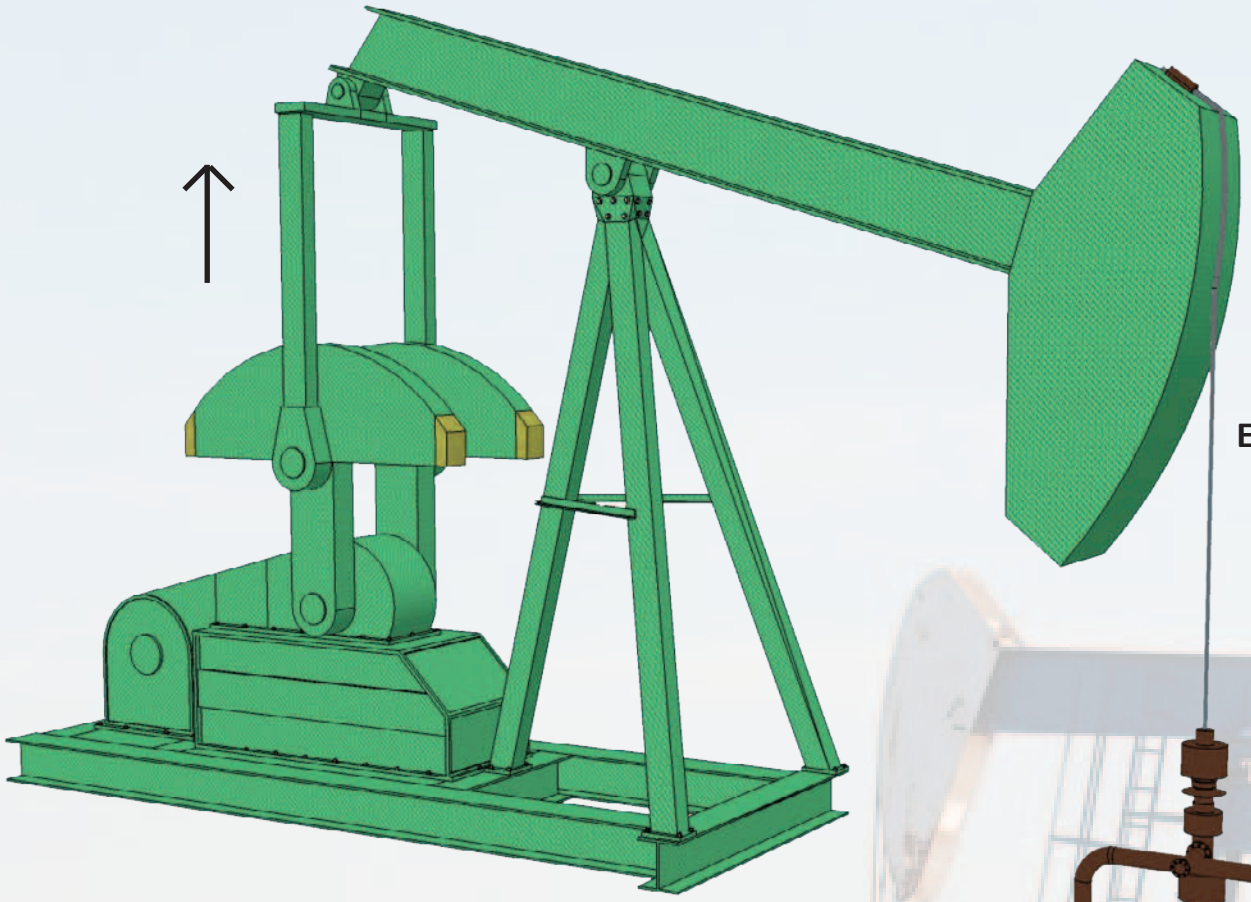
- Control torque on drill string
- Low duty cycle braking

Solution

- M3452 Heavy Duty Braking Transistor
- M3775R Resistive Load Bank

On-Shore

Pumpjacks



Regenerative Energy Created

Pumpjacks are used to mechanically pump oil from the oil well when the bottom hole pressure isn't strong enough to push oil to the surface.

Pumpjacks are powered by a prime mover, which in many cases is powered by an electric drive/motor combination. The prime mover drives pulleys that move a pair of counterweighted cranks. The cranks are counterweighted to aid in lifting the string. Regenerative energy is created when the string is lowered (pulls itself) back into the hole. Rigs counterweighted properly may require as little as 5% duty cycle ratings, whereas those not counterweighted well may require up to 30%+.

Bonitron offers Braking Transistors, Resistors, and Line Regeneration units to absorb the excess regenerative energy created on the pumpjack downstrokes. With pumpjacks being counterweighted, it's common for motors to be only 20 - 150HP. Many applications allow the regenerative energy to be placed back on the available AC line, which can be done with our M3645 Line Regeneration units. On remote pumpjacks where no AC line power is available and generators are used, the Transistor is required to protect the generator from energy feeding back into the generator.

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On-Shore

Pumpjack

- Mechanically pumps oil from the oil well if the bottom hole pressure isn't sufficient enough to push liquid to the surface

Requirement

- Motors typically up to 150hp
- Requires braking on downstroke
- Low duty cycle braking
  - 20 - 30% on unbalanced rigs
  - 5 - 20% duty on balanced rigs

Solution

- Braking Transistor
  M3452 Heavy Duty or
  M3575T Standard Duty
- M3775R Resistive Load Bank
- M3545 and M3645 Line Regeneration Unit

New M3545 Single Phase Line Regen

Bonitron Solutions

Line Regeneration

- No resistor necessary
- 150% overload for 60 seconds
- Simple hook-up with no software setup
- Over 99% efficient

M3545

- Single or 3-Phase
- 208 - 480VAC support
- Single Phase - 5A cont. each
- 3-Phase - 15A cont. each

M3645

- 208 - 600VAC support
- 100A continuous each
- Digital display with event logging

Single Phase Power Supply

- M3712
- Power 3-Phase drives from single phase source
- Create a common DC Bus

Resistive Load Banks

- M3575R or M3775R
- Ratings up to MegaWatts
- Galvanized steel enclosure
- NEMA-3R and stainless steel options

Braking Transistor

- M3452 or M3575T
- Up to 1600A per unit (Master/Slave Capable)
- Local and remote status monitoring
- System can be reconfigured on-the-fly

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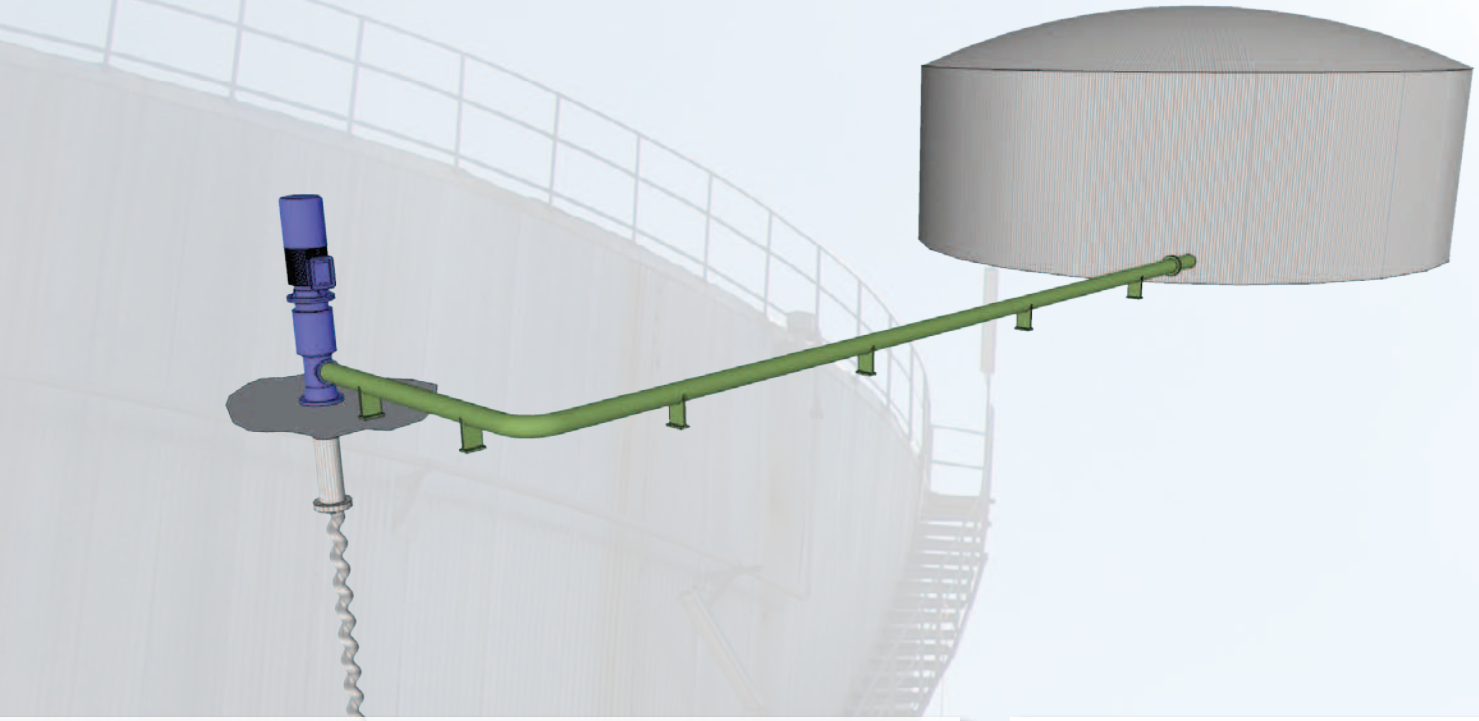
On-Shore

Progressive Cavity Pump



Progressive Cavity Pumps (also known as eccentric screw pumps, cavity pumps or PCPs) act similar to a screw that brings oil to the surface. It is critical for PCP applications to have constant, uninterrupted power. If the drive rotating the screw loses power and trips on an undervoltage condition, the process may experience several hours of downtime and lost production. If the process is pumping oil with high viscosity levels (thick like molasses) then downtime can be even longer, as it is typical to wait for the oil to drain back to the bottom before restarting to help prevent equipment damage. The next page elaborates with a case study and the benefits of matching a Bonitron Undervoltage Solutions with your PCP application.

Bonitron Solutions

UPD Uninterruptible Power for Drives

- Protect from power sags and outages
- S3460 and S3534 Series
- Up to 500kW
- Up to 15 Minutes

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info@bonitron.com

On-Shore

6-week Payback at $50 per Barrel!

Power sags and outages can trip drives - causing hours of downtime and lost production while waiting for petroleum to return to the bottom in order to restart.

Typical oil fields can see 50 or more voltage sags per year.

Drastically increase availability!
Prevent Undervoltage faults with Bonitron DC Bus Ride-Thru

Case Study

Variable Frequency Drives (VFDs) are commonly used to drive Electrical Submersible Pumps (ESP), Beam Pumps, and Progressive Cavity Pumps (PCP), which extract oil from the ground.

The Problem:
VFDs on Electrical Submersible, Beam, and Progressive Cavity Pumps are susceptible to voltage sags and reclosure operations (tripped circuit breakers). A short sag or interruption in voltage (less than a 1/10th of a second) is enough to cause an undervoltage trip on a VFD, resulting in minutes or hours of downtime and costly production losses. A typical oil field can see 50 or more voltage sags per year, with 25+% able to trip the drive. Remote applications using reclosure (automatically resetting circuit breakers) to clear temporary faults from lightning, animal, or tree contact, will see more full interruptions in power. During these reclosure operations, the drives will trip — ***typically resulting in complete field outages.***

The Solution:
Bonitron Undervoltage Solutions regulate the drive's DC bus voltage during sags and outages so that the pump will operate without interruption. ***Case studies show an increase of pump availability from 95.5% to 99.2%, resulting a six-week payback (@ $50 barrel).***

A major oil extractor developed an oil field in Venezuela, which included the expansion and reconditioning of their existing 24 kV distribution system to ensure reliable service for the new and existing wells. All of the ESPs and PCPs, and some of the Beam Pumps, are driven by VFDs. **Disruption to the PCP drives from voltage sags or reclosure operations resulted in 8 – 16 hours of lost production *per occurrence.*** About 255km of overhead lines result in high exposure to lightning events resulting in subsequent sags and interruptions that cause well-site drives to trip, severely impacting production goals.

A strategy was developed to combine Bonitron RideThru with a reclosure system so that most disturbances would have no effect on production. Bonitron Ultracapacitor Ride-Thru System's energy storage capacity was coordinated with the reclosure settings to allow for single or multiple reclosure operations. The Drive RideThru provided 0.75 seconds (45 cycles) of interruption capability on 60 hp PCP drives. (Bonitron offers systems protecting up to 1MW for up to 15 minutes.

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Off-Shore

Active Heave

Anchored

Jack-up

Untethered

Bonitron allows you to gain the same advantages off-shore!

Ideal Off-shore Options:

- Stainless Steel resistors
  - 306, 316, etc.
- Conformal coating on electronics

Untethered Rigs

- Platform barge must move with great precision
- Side thrusters stop or change direction quickly, causing the DC bus voltage level to rise

Requirement

- Requires overvoltage protection
- High power braking with varying duty cycles

Solution

- Braking Transistor (M3452 or M3575T) and M3775R Braking Resistor

Additional Solutions

bonitron.com/industry-oil.html

Scan the QR code to learn more about Bonitron Oil Industry Solutions

Connect to any brand VFD with DC bus connections

Common Bus

Single Phase Power Supplies
3-Phase Power Supplies
Common Bus Sharing Diodes
Isolation Diodes
Bus Filter Capacitance

Maintenance

Capacitor Formers
Capacitor Testers

Overvoltage

Braking Transistors
Braking Resistors
Line Regeneration
Braking for Servo Drives

Undervoltage

Uninterruptible Power for Drives (DC Bus Ride-Thru)
Voltage Regulators
Chargers and Dischargers
Energy Storage

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