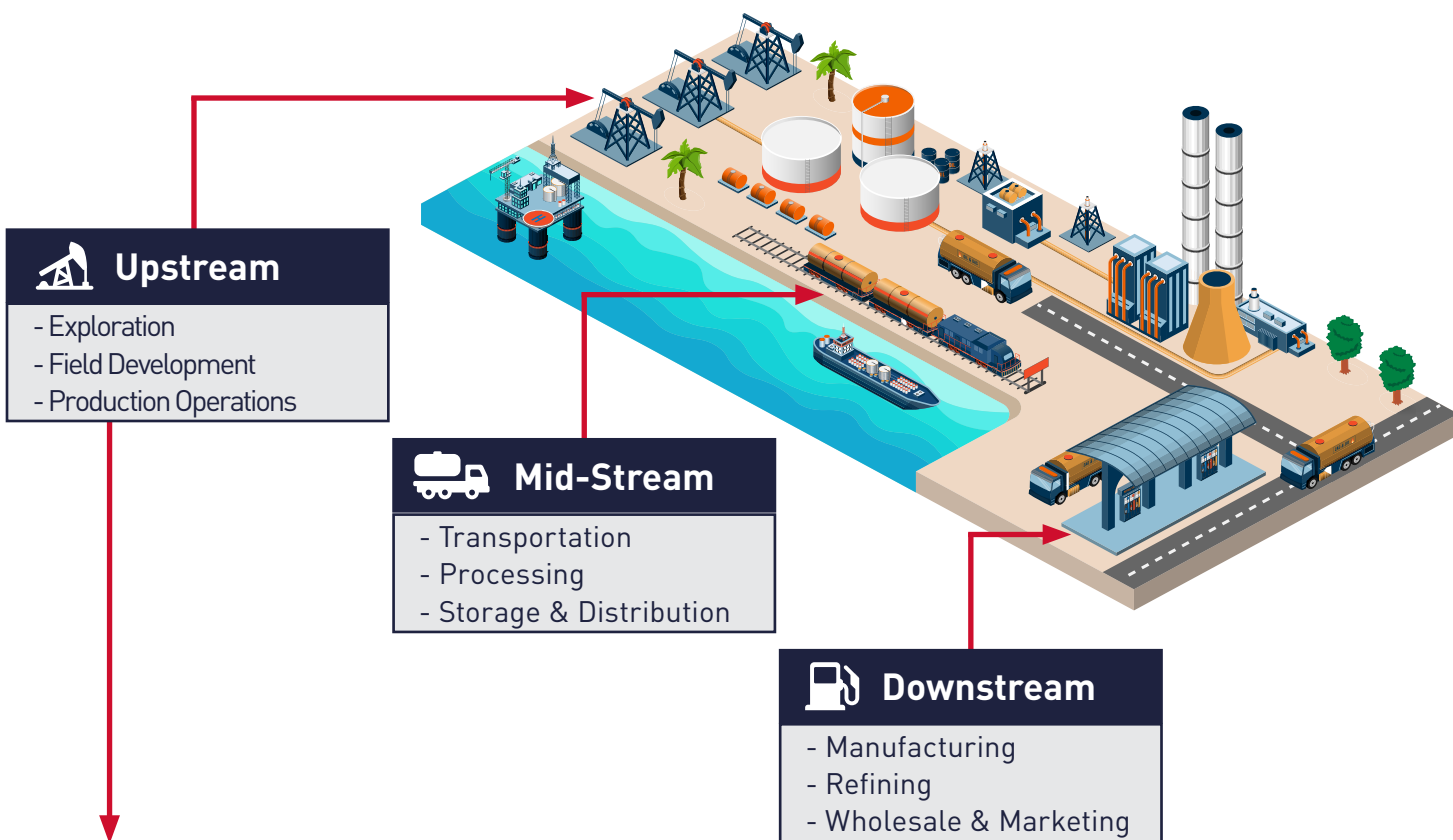


# Power Quality Solutions for Oil and Gas



MTE Corporation helps many oil and gas producers by delivering a wide array of optimized, power quality solutions. Oil producers use a variety of pumps in their operations that are driven by variable frequency drives, which introduce harmful harmonic distortion. Unmitigated harmonics can result in equipment damage, costly downtime, nuisance tripping, and reduce efficiency.

## MTE's primary focus is on Upstream, Onshore Production



### Onshore Pump Types

- Electric Submersible Pump (ESP)
- Reciprocating Rod (Rod Pump)
- Progressing Cavity Pump (PCP)
- Gas Lift
- Plunger
- Hydraulic Lift

Artificial Lifting selection depends on a number of parameters such as: reservoir and surface characteristics, flow rates, and operating conditions.

### MTE solutions applicable to

#### ESP

- » High flow rates
- » No sand
- » Low gas

#### ROD PUMP

- » Low flow rates
- » Heavy oil
- » Some sand
- » Low gas

#### PCP

- » Heavy oil
- » Some sand
- » Low gas
- » High viscosity

## Power Quality Challenges for Oil & Gas Extraction



### Cost of Downtime

92% of shutdowns are unplanned and result in significant monetary losses



### Safety and Welfare

Risky intervention maintenance can result in serious injury



### Environmental Factors

Remote locations face inclement transients from weather and storms



### Ownership and Maintenance Costs

42% of upstream drilling equipment is over 15 years old



### Downhole Sensor Interference

Common mode noise can disrupt sensitive downhole sensor readings

## LINE SIDE POWER QUALITY

### CHALLENGE

Many oil fields are in remote locations, often hundreds of miles from support personnel. Unscheduled downtime and equipment failures can result in extensive losses in revenue and productivity.

### MTE LINE SIDE SOLUTIONS

#### FEATURES

- Harmonic Mitigation
- Adaptive Passive Technology
- Integrated Reactor Design

#### BENEFITS

- IEEE-519 utility compliance
- Compliance to IEEE-519 even as wells age and loads decrease
- VFD protected from damage/failure due to transient utility voltage.

## LOAD SIDE POWER QUALITY

### CHALLENGE

The increase in VFDs over the last decade has also introduced many of the issues caused by harmful, unwanted harmonics including premature motor and transformer damage, and sensor signal interference.

### MTE LOAD SIDE SOLUTIONS

#### FEATURES

- Voltage Distortion Mitigation
- Common Mode Attenuation
- High Frequency Motor Protection

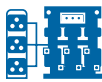
#### BENEFITS

- Step-up transformers protected from damage/failure due to VFD PWM signal
- Motor bearings protected from premature failure
- Critical sensors and safety detection systems protected from malfunction and failure
- Permanent magnet motors require the same protection as induction motors

# Featured Oil & Gas Solutions

## LINE SIDE SOLUTIONS

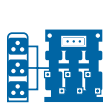
HF



### Matrix® AP

- Meets IEEE-519 requirements
- Adapts to load changes
  - » IEEE-519 compliant down to 50% load
- Improves system efficiency and reliability
- Extends service life of electrical equipment

HF



### Matrix® E-Series

- Helps support IEEE-519 compliance
- 8% THID at full load, 12% THID at 40% load
  - » w/  $\geq 6\%$  impedance (DC choke/reactor)
- 12% THID at full load, 17% THID at 40% load
  - » w/out DC choke/reactor
- Modular design for easy panel integration

RZ



### RL Reactors

- Protects against surges and transients
- Reduces
  - » Nuisance over-voltage tripping
  - » Harmonic distortion (30-35%)

## LOAD SIDE SOLUTIONS

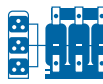
MP



### SineWave Nexus™

- Only comprehensive motor protection solution on the market
  - » 5-year motor bearing warranty
- Eliminates common mode and differential mode noise
- Pricy "VFD" cable and insulated bearings not required
- Extends the life of non-inverter and inverter duty motors
- Combines the protection of an isolation transformer and sinewave filter in one compact solution
- Ideal solution for critical applications and hazardous (Class 1&2) locations

MP



### High Frequency SineWave Guardian®

- Ideal solution for permanent magnet motors (PMM) protection
  - » Protects PMM's from demagnetization due to overheating
- Low voltage drop
  - » Max 6% at 150Hz
  - » Max 12% at 300Hz

MP



### SineWave Guardian®

- Better than 5% Total Harmonic Voltage Distortion (THVD)
- Low voltage drop
  - » Only a 6% insertion loss
- Better efficiency than traditional LC filters
  - » Greater than 98% efficiency

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**MTE**  
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