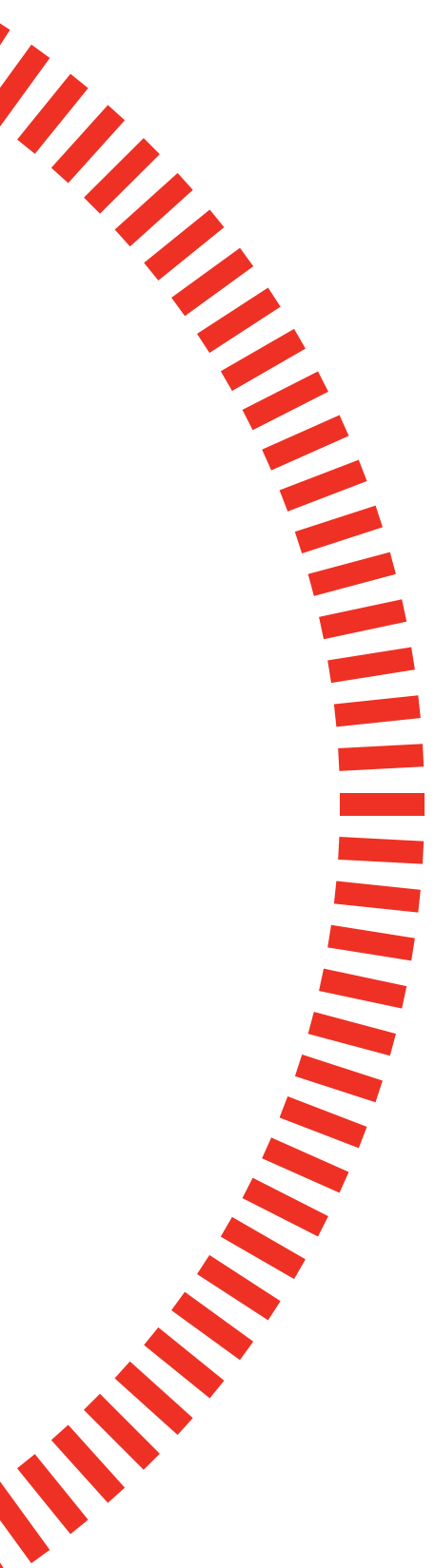


# Process and Flow Technologies





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## Process and Flow Technologies

We provide process expertise and innovative technology that enhance the efficiency and profitability of your business.

Whether in oil and gas or across various industrial markets, we work with you from the beginning to develop an integrated solution with superior performance—maximizing your project lifecycle economics.

Service expertise drives predictable uptime that is critical to your operation. In every situation, you can rely on us to provide quick and effective support throughout the entire life of your project. Our deep knowledge of your processes ensures you have the latest technology for your application to get the job done right, with trusted products you can depend on – first time, on time, every time.

By consistently providing reliable, technical solutions, we will help your business grow and provide you with the confidence you are looking for in a strategic partner.

# Services and Aftermarket

We are more than just an equipment supplier. Let NOV support you for the life of your project.



## Services We Provide

We offer a global support system for both our Process and Flow Technologies products and a wide variety of outside equipment. From engineering consultation and repairs to spare parts and training, we are here to proactively serve the growing day-to-day needs of our industries. Backed by a team of trusted technicians, we work alongside our partners to achieve their goals. So whether your reciprocating pump needs a new fluid end, or you need to optimize a production site that's working inefficiently, we've got the team that can help.

Service expertise drives predictable uptime that is critical to your operation. In every situation, you can rely on us to provide quick and effective support throughout the entire life of your project. Our deep knowledge of your processes ensures you have the latest technology for your application to get the job done right, with trusted products you can depend on – first time, on time, every time.

### Consulting and Engineering Services

- We provide facilities layout and equipment selection consulting, custom engineering of equipment based on client needs, and assessments of inefficient operations, maintenance and equipment.
- Regular data reviews and consultations on process equipment packages.

### Spare Parts and Universal Parts

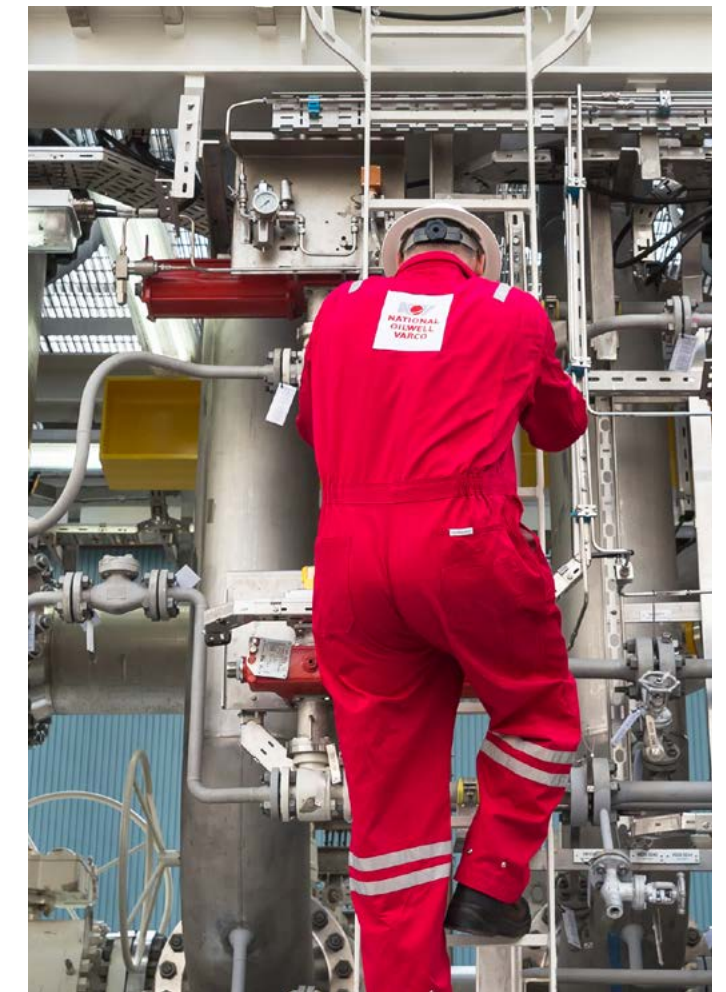
- We provide and install spare parts for all our products as well as Universal Parts to keep your equipment up and running.

### Field Services

- We support our customer's onsite after equipment delivery providing local field services like installation, commissioning, decommissioning, trouble shooting and maintenance.
- We review and confirm proper equipment choice for the customer's situation and application.
- We provide regular health checks of equipment as needed, including optimization and trouble-shooting.

### Automation and Technology Support

- We provide support for automated, onsite control systems and remote monitoring services.



### Training Services

- We provide specialized training courses, tailored to fit the customer's need, available at the field location or in a classroom convenient for our customers.

### Repair Services

- We provide repairs through our global network of convenient service facilities.

# Oil & Gas

At NOV, we work hard to develop the tools, integrated systems and teams to help you produce and deliver oil & gas safely, effectively and responsibly.



## Oil & Gas



Offshore  
Production &  
Processing



Land Production  
& Processing



Salt Water  
Disposal



Artificial Lift



Mud Mixing



Midstream



## Offshore Production & Processing

We provide global solutions for oil, water, gas and sand separation and processing in the Offshore Production industry. Our capabilities include full-service, engineered design packages with in-house manufacturing and fabrication services to provide the best economic value to our customers.

We also deliver individual componentry and products to provide an itemized solution. Whether our customers need a few ANSI 150 ball valves or a 2,000 ton topsides process package, we are prepared to provide the solution.

### Production Manifolds

- Comprised of NOV choke valves and pipes, transfer fluid more efficiently
- Able to meet all operating conditions, be it high pressure or fluid containing an aggressive medium
- Safe, cost effective
- Efficient design with maximum reliability



### Chokes

- Used to adjust and control flow rate or pressure in your production system
- Stepping actuator and automation optional
- Our submicron grade carbide has the highest impact and erosional-resistance in the market
- Extend service life with superior performance, while increasing safety and efficiency



### Crude Dehydration

- Treat oil to ensure pipeline quality crude
- Custom engineered to meet our customer's needs
- Designed to meet the most demanding environments
- Horizontal and vertical grid configurations available
- Heating options include direct-fired, internal tube bundle, or external heat exchanger



### Gas Dehydration

- Treat gas in a wide range of flows and conditions
- Custom engineered to meet our customer's needs
- Based on TEG and utilizes low maintenance processes to ensure gas export requirements are achieved using a triethylene glycol process
- Dependable NOV plunger pumps are used to circulate glycol through the system



### Fuel Gas Conditioning

- Removes liquid and solid contaminants, and regulates the pressure, temperature and BTU content to meet fuel gas specifications
- Used to turn raw gas into fuel for power generation and compressor turbines
- Includes gas scrubbers, filter separators, pressure control valves, heaters and heat exchangers
- Custom engineered to meet our customer's needs



## Separation

- Compact, skid-mounted crude oil separation package
- Uses four phase separator with our Tore™ Online Vessel Desander (OVD) technology to more efficiently handle solids
- Best-in-class solution for handling sandy production fluids
- Custom engineered to meet our customer's needs



## Solids Handling and Cleaning (Tore™)

- Solids separation for production processes using our patented Tore™ technology
- Sand handling equipment for various applications includes: Tore™ Trap, Tore™ OVD, Tore™ Scrub
- Allows sand removal from a fluid stream without the need to take the Tore Trap desander offline
- Removal of sand prevents sand from reaching production equipment, eliminating erosion problems and improving production efficiency



## High-Efficiency Vessel Internals

- Engineered internal parts, customized to meet customers specific needs
- Proven proprietary calculation procedures and state-of-the-art design tools allow our experts to recommend the proper configuration
- Can handle gas/liquid, liquid/liquid, solids/liquid
- Maximize separation efficiency and through-put
- Minimize weight and footprint
- Internals include Type "S" inlet, Calming Baffle, Mist Extractor, Vane Pack, our patented Tore™ OVD solids removal system and more



## Produced Water Treatment (WaterWolf™)

- Secondary separation process to treat produced water
- Provide custom engineered solutions to manage increasing levels of water production including: bulk oil water separation, hydrocyclone packages, and fine filtration
- Breakthrough technology, WaterWolf™ Dynamic Oil Recovery System is a skid-mounted solution that combines the non-shearing action of progressing cavity pumps with deoiling and desanding hydrocyclones, eliminating the need for chemicals or filters



## Seawater Treatment

- Provide compact systems for seawater injection to meet reservoir pressure maintenance requirements
- Includes media filtration, vacuum strip deoxygenation towers, and centrifugal pumps
- Custom engineered to meet each customer's needs
- Cost effective, proven solution



## Sump Caisson (PetroPile™)

- Most effective device available today for collection, treatment, and discharge of wastewater from offshore platforms
- Over 30 years of field experience and design improvements have culminated in the patented, environmentally sound design
- Equipped with non-clogging baffles which help remove oil from the sand which then exits the pile without any build up
- Operates successfully on tension leg, semi-submersible, and spar platforms and remains unaffected by the motion of the platform
- Custom engineered to meet each customer's needs



## Progressing Cavity Pump Systems (Mono™, Moyno™)

- Reliable operation
- Interchangeable components
- High degree of accuracy and control
- Available with chemically resistant and hygienic materials
- Capable of handling solids approaching 40%
- Up to 990 gal/min
- Maintain-in-place technology available



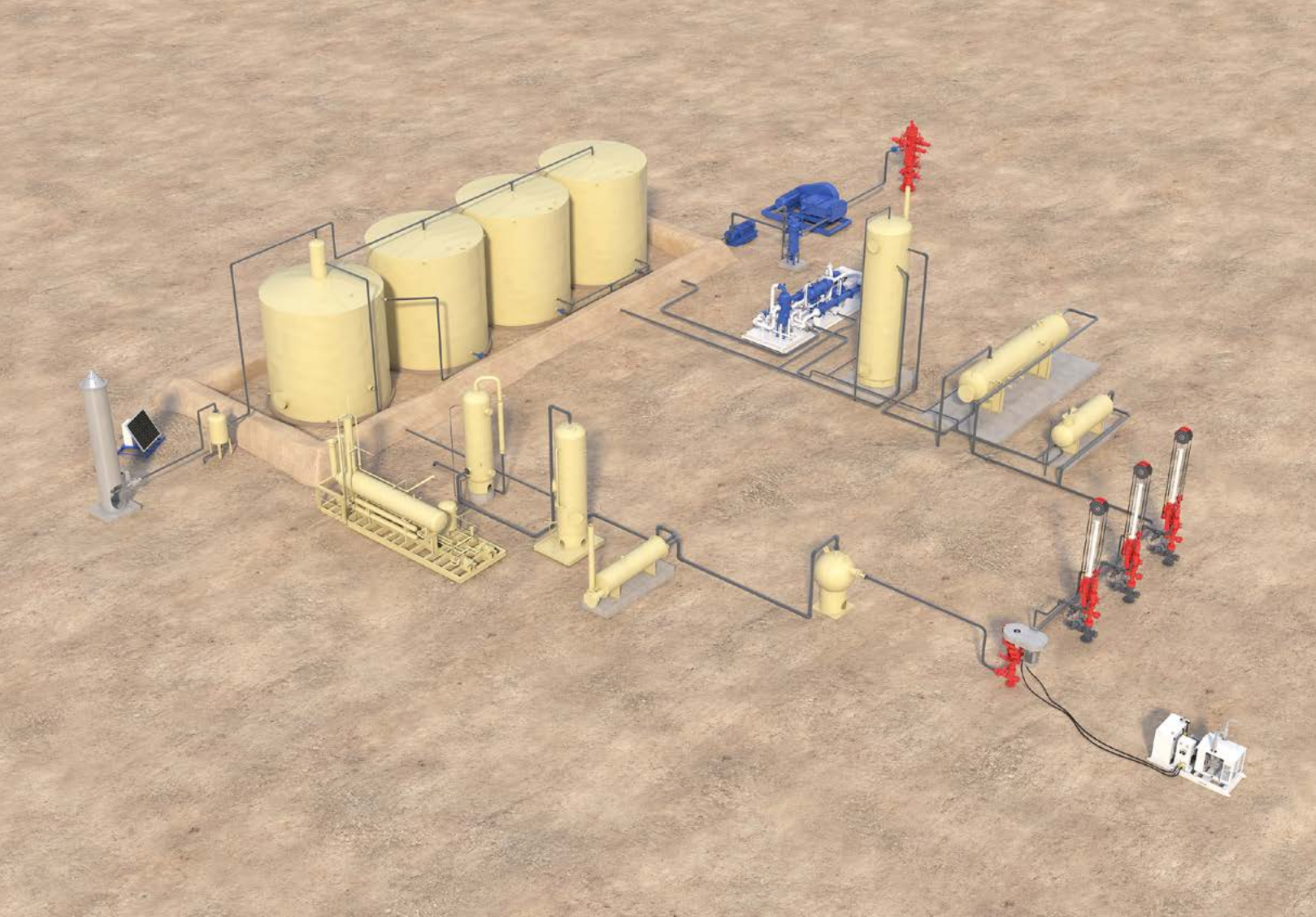
## Boarding Valves

- Our HPT Boarding Valves are safety valves that allow emergency flowline shutdown
- Boarding Shut Down Valve (BSDV) recognized as Safety Shutdown Valve (SSV)
- Can handle up to 15,000 psi
- Skid-mounted package unit also available
- Meets API 6A ANNEX F performance requirements, API 6AV1 and API 6FA certified

## Closures (Yale™, Sentry™)

- True quick opening closures – typically less than 90 seconds
- Focus on safety and ease-of-operation
- Simple operation – no special tools required
- Sizes available – 2" through 74"
- ASME Boiler Pressure Vessel Code Section VIII, Division 1 and all applicable pipeline design codes compliant





## Onshore Production & Processing

We provide an extensive offering of onshore production solutions based on proven products and proprietary technologies. From Reciprocating Pumps to Separators to Produced Water Treatment equipment, we have the selection to construct the entire wellsite. Our patented Tore™ products provide unmatched separation, and our line of pumps is the most widely used in the industry.

Whether customers are interested in our “tried and true” products that have been used for over a century, or our cutting edge new technologies, we can provide the ideal solution to build an efficient, reliable production site.

### Separators

- Products include: Free Water Knock Outs; 2,3, and 4 Phase Separators; Heater Treaters; Gas Processing Units; Testing Packages; Cabin Units; Horizontal Gun Barrel
- Separation of oil, gas and water from the production stream
- Vertical and horizontal separators can be customized in a variety of units
- Certain separation equipment is available in our Quick Ship program
- Pre-engineered and field proven



### Chokes (T3)

- Used to adjust and control flow rate or pressure in your production system
- We carry T3 chokes and actuators
- Stepping actuator and automation optional
- Our submicron grade carbide has the highest impact and erosional resistance in the market
- Extend service life with superior performance, while increasing safety and efficiency



### Crude Dehydration

- Treat oil to ensure pipeline quality crude
- Custom engineered to meet each customer’s needs
- Designed to meet the most demanding environments
- Horizontal and Vertical-grid configurations available
- Heating options include direct-fired, internal tube bundle, or external heat exchanger



### Fuel Gas Conditioning

- Removes liquid and solid contaminants, and regulates the pressure, temperature and BTU content to meet fuel gas specifications
- Used to turn raw gas into fuel for power generation and compressor turbines
- Includes gas scrubbers, filter separators, pressure control valves, heaters and heat exchangers
- Custom engineered to meet our customer’s needs



### Reciprocating Pumps (National™, Oilwell™, Gaso™, Wheatley™, Bear™)

- Positive displacement production pumps deliver high pressures with a small quantity of liquid
- The industry’s largest array of single-acting quintuplex models available anywhere
- The world’s largest pump distribution network
- Available as continuous and intermittent duty pumps in single-acting and double-acting models with input horsepower ranges from 2 to 2600



## Multistage Surface Pumps

- H-pump used for high volume and high pressure fluid movement
- The dual bearing systems provide a minimum L-10 life rating of 25,000 hours at all thrust loads up to 20,000 lbf
- The mechanical seal (located in the fluid end) is completely separated from the thrust chamber which prevents any cross contamination should seal leakage occur
- The modular skid is a universal design that offers significant cost savings and shorter lead times while maintaining motor torque to stabilization requirements.
- Standard packages include pressure, oil level, and vibration sensors as specified by the customer to meet critical application requirements



## Fabricated Pump Packages

- Highly-engineered, custom reciprocating unitization packages
- Complete skid-mounted units, pre-assembled and tested, ready for installation
- Wide performance range offering
- Hazardous Area / Non Hazardous Area Classifications
- Variety of drivers, transmission systems, control systems and accessories available for selection



## High-Efficiency Vessel Internals

- Engineered internal parts, customized to meet customers specific needs
- Proven proprietary calculation procedures and state-of-the-art design tools allow our experts to recommend the proper configuration
- Can handle gas/liquid, liquid/liquid, solids/liquid
- Maximize separation efficiency and through-put
- Minimize weight and footprint
- Internals include Type "S" inlet, Calming Baffle, Mist Extractor, Vane Pack, our patented Tore™ OVD solids removal system and more



## Progressing Cavity Pump Systems (Mono™, Moyno™)

- Used for offloading applications, downstream of the wellhead as alternate to local separation in the form of multi-phase fluid flow with our Moyno™ Tri-Phase™ model, as well as applications in LACT units
- High degree of accuracy and control
- Available with chemically resistant and hygienic materials
- Capable of handling solids approaching 40%
- Up to 990 gal/min



## Solids Handling (Tore™)

- Solids separation for production processes using our patented Tore™ technology
- Sand handling equipment for various applications includes: Tore™ Trap and Tore™ Online Vessel Desander
- Allows sand removal from a fluid stream without the need to take the Tore Trap desander offline
- Removal of sand prevents sand from reaching production equipment, eliminating erosion problems and improving production efficiency



## Sand Traps

- Vertical and spherical sand traps separate solids from the gas stream
- Installed close to the wellhead to remove solids upstream of surface equipment
- The removed solids accumulate in the bottom of the vessel, while the solids free gas overflows the outlet
- The sand trap allows well operation with less than perfect well clean-up, saving on-site well cleanup costs
- Low back pressure design allows high flow rate



## Storage Tanks

- Available for storage of liquid in various applications
- Steel tanks, fiberglass tanks and gun barrels available, along with pedestals
- Fiberglass tanks are manufactured to meet the standards set forth in ASTM 3299, ASTM 4097, ASME RTP1, and API 12P
- Steel tanks are built to API specs and are API 12F monogrammed and non-monogrammed
- We also manufacture stairways, walkways and other customized products to be used with our tanks at lease sites
- Tanks come in the following sizes: 300 bbl, 400 bbl, 500 bbl, 750 bbl, 1000 bbl



## Produced Water Treatment (WaterWolf™)

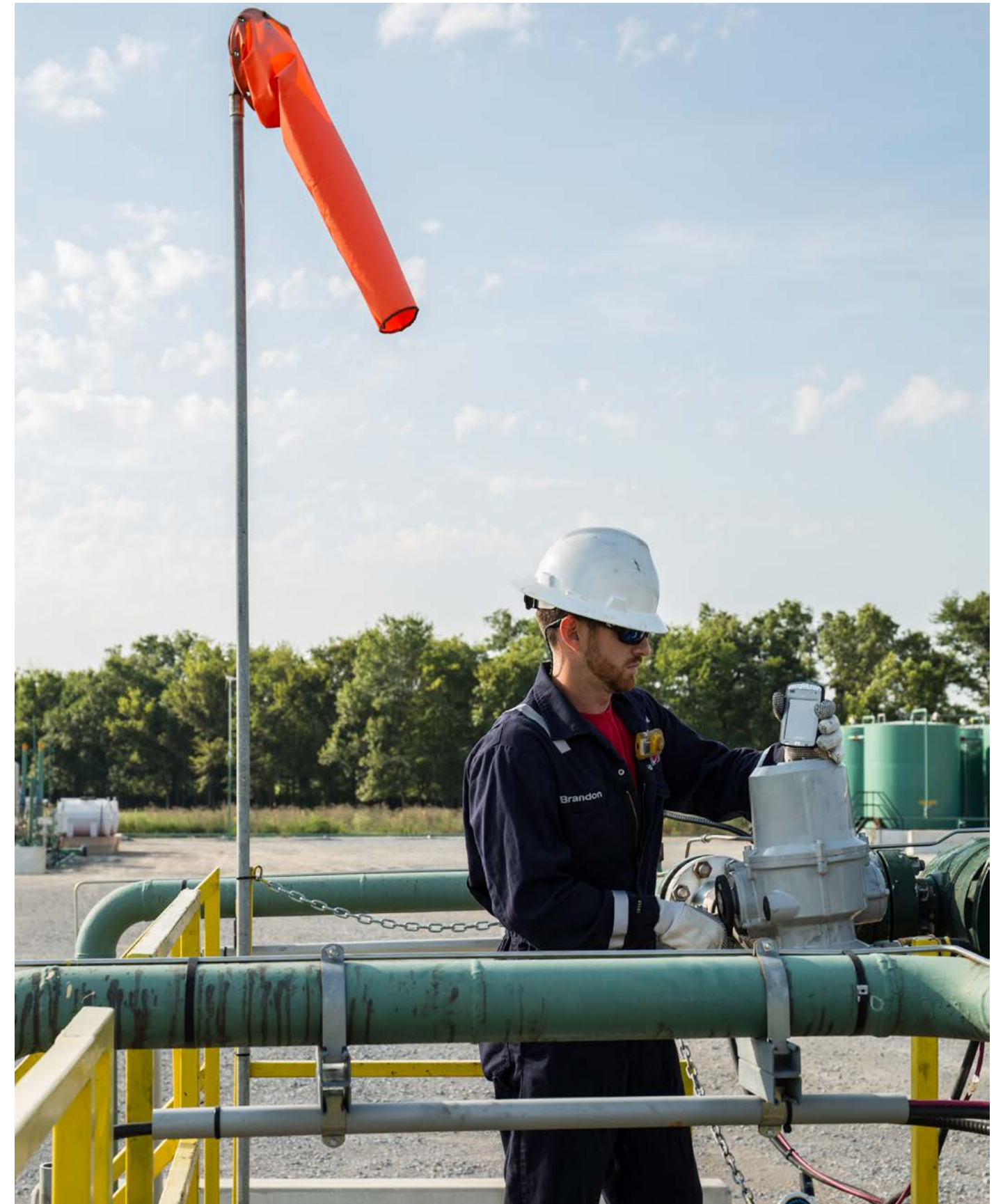
- Secondary separation process to treat produced water
- Provide custom engineered solutions to manage increasing levels of water production including: bulk oil water separation, hydrocyclone packages, and fine filtration
- Also provide a brand new WaterWolf™ Dynamic Oil Recovery System
- Skid-mounted solution that combines the non-shearing action of progressing cavity pumps with deoiling and desanding hydrocyclones, eliminating the need for chemicals or filters





## Combustion and Flaring

- Full line of Enclosed Vapor Combustors (EVC 20, 100, 200, Dual Train)
- Stainless steel design is field proven, and includes a solar package option for remote locations
- Meets all EPA Quad O requirements; tested and certified “99% plus” for destruction of vent emissions from oil and condensate tank batteries, loading operations and storage facilities
- Meets 40 CFR 60.18 EPA regulations
- Or stick flare provides a smokeless combustion solution for high pressure, high flow produced gas





## Salt Water Disposal

We understand that efficiency is key. That's why we aim to provide the ideal solution for Saltwater Disposal sites, eliminating old, inefficient equipment and techniques.

With technologies like our Moyno™ Progressing Cavity Pumps used in offloading to help coalesce oil into larger droplets, and our Horizontal Gun Barrel with Tore™ technology that allows smaller oil droplets to rise, leading to more oil recovery, we are breaking the mold of conventional Saltwater Disposal facilities.

## Dynamic Oil Recovery (WaterWolf™)

- A skid-mounted produced water treatment solution that combines the non-shearing action of progressing cavity pumps with deoiling and desanding hydrocyclones
- Effectively recovers oil and removes suspended solids from produced water in a single stage of treatment without the use of chemicals or filters
- Current standard methods require a complex battery of skim tanks and expensive chemical treatments – the WaterWolf eliminates this



## Storage Tanks

- Available for storage of liquid in various applications
- Steel tanks and fiberglass tanks available, along with pedestals
- Fiberglass tanks are manufactured to meet the standards set forth in ASTM 3299, ASTM 4097, ASME RTP1, and API 12P
- Steel tanks are built to API specs and are API 12F monogrammed and non-monogrammed
- We also manufacture stairways, walkways and other customized products to be used with our tanks at lease sites
- Tanks come in the following sizes: 300 bbl, 400 bbl, 500 bbl, 750 bbl, 1000 bbl



## Sand Handling (Tore™)

- Solids separation for production processes using our patented Tore™ technology
- Sand handling equipment for various applications includes: Tore™ Trap, Tore™ Online Vessel Desander, Tore™ Scrub
- Allows sand removal from a fluid stream without the need to take the Tore Trap desander offline
- Removal of sand prevents sand from reaching production equipment, eliminating erosion problems and improving production efficiency



## Salt Water Disposal

## Horizontal Gun Barrel

- Highly-engineered separation vessel, including high-efficiency internals like distribution baffles and online rag layer removal for improved performance
- Horizontal orientation improves separation efficiency and produces dry oil
- Tore™ OVD solids handling technology eliminates tank cleanouts
- Reduce oil droplet rise distance vs typical vertical gun barrel



## Progressing Cavity Pump Systems (Mono™, Moyno™)

- Used for offloading, progressing cavity equipment pumps water without blending or shearing
- Maintains larger oil droplet size and allows better recovery
- Can unload a standard tanker truck in about 10 minutes
- Our Moyno™ and Mono™ progressing cavity pump technology has an 85+ year history of success in industrial use



## Reciprocating Pumps (National™, Oilwell™, Gaso™, Wheatley™, Bear™)

- Positive displacement production pumps deliver high pressures with a small quantity of liquid
- The industry's largest array of single-acting quintuplex models available anywhere
- The world's largest pump distribution network
- Available as continuous and intermittent duty pumps in single-acting and double-acting models with input horsepower ranges from 2 to 2600



## Multistage Surface Pumps

- H-pump used for high volume and high pressure fluid movement
- The dual bearing systems provide a minimum L-10 life rating of 25,000 hours at all thrust loads up to 20,000 lbf
- The mechanical seal (located in the fluid end) is completely separated from the thrust chamber which prevents any cross contamination should seal leakage occur
- The modular skid is a universal design that offers significant cost savings and shorter lead times while maintaining motor torque to stabilization requirements.
- Standard packages include pressure, oil level, and vibration sensors as specified by the customer to meet critical application requirements





## Artificial Lift

We deliver field-proven, highly-engineered artificial lift equipment and packaged solutions all over the world. Our breakthrough innovations in hydraulic rod pumping systems, progressing cavity pump systems and automation controls & monitoring are changing the way operators view their long-term production.

Our artificial lift professionals will collaborate with you to properly evaluate well conditions and provide customized solutions that help you optimize your production for the life of your wells.

## Rod Pumping Systems (Corlift™, Morlift™)

- Enhance safety, increase efficiency and longer mean time between failure (MTBF)
- Smaller footprint and quick installation
- Quickly adjusts stroke speed and length
- Lifting capabilities up to 40,000 lbs
- ISO 9001, EPA and API certified



## Progressing Cavity Pump Systems

- Oil production and dewatering applications
- Efficiency, reliability and low life-cycle cost
- Electric and hydraulic wellhead drives
- Minimal environmental impact
- Pump Optimization Design Software



## Production Service Hookup (Hercules™, Rodec™, Magnum™, Yale™)

- 70 years of manufacturing experience
- Complete designs for progressing cavity pump & rod pumping applications
- Products include:
  - Stuffing Boxes & Packing
  - Blow Out Preventers (BOP's)
  - Hercules™ Rod & Rodec™ Tubing Rotators
  - Polished Rod Accessories
  - Wellheads
  - Hookup Accessories



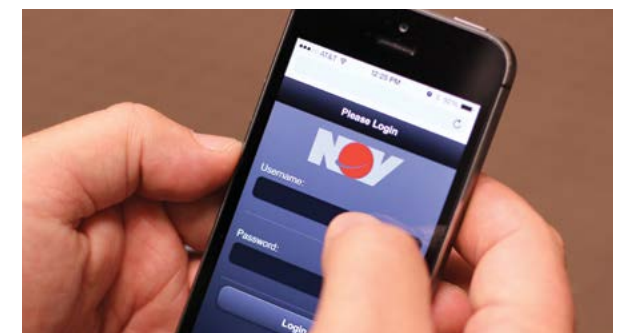
## Wear Prevention (Hercules™, Rodec™)

- Asset protection for highly corrosive environments
- Wear mitigation, corrosion control, inspection & advisory programs
- Our products and services include:
  - Rod & Tubing Rotators
  - Tuboscope™ Rod & Tubing Guides
  - Rod & Tubing Coatings
  - Rod Guide Advisory Program (RGAP™)
  - WellCheck™ Inspection System
  - WellTrack™ Reporting Software



## Automation, Control & Monitoring (Guardian™)

- Comprehensive set of products and services for optimization, monitoring and control of various artificial lift applications
- Complete management, flexibility and control over well production and well data
- Field-proven user friendly units
- Latest modeling and production proprietary optimization software
- On-site or via remote well control & monitoring





## Mud Mixing

Mud mixing is a demanding application requiring reliability from all equipment in the system. We are able to provide top of the line mixing equipment to keep these systems up and running with very little maintenance.

Our equipment is very efficient requiring only about half the power of other comparable systems while maintaining a uniform distribution within the mud for optimum drilling consistency.

Our impeller technology can handle the harsh conditions and prevent erosion. We consistently achieve optimal performance, reliability and efficiency in these applications.

## Agitators (Chemineer™)

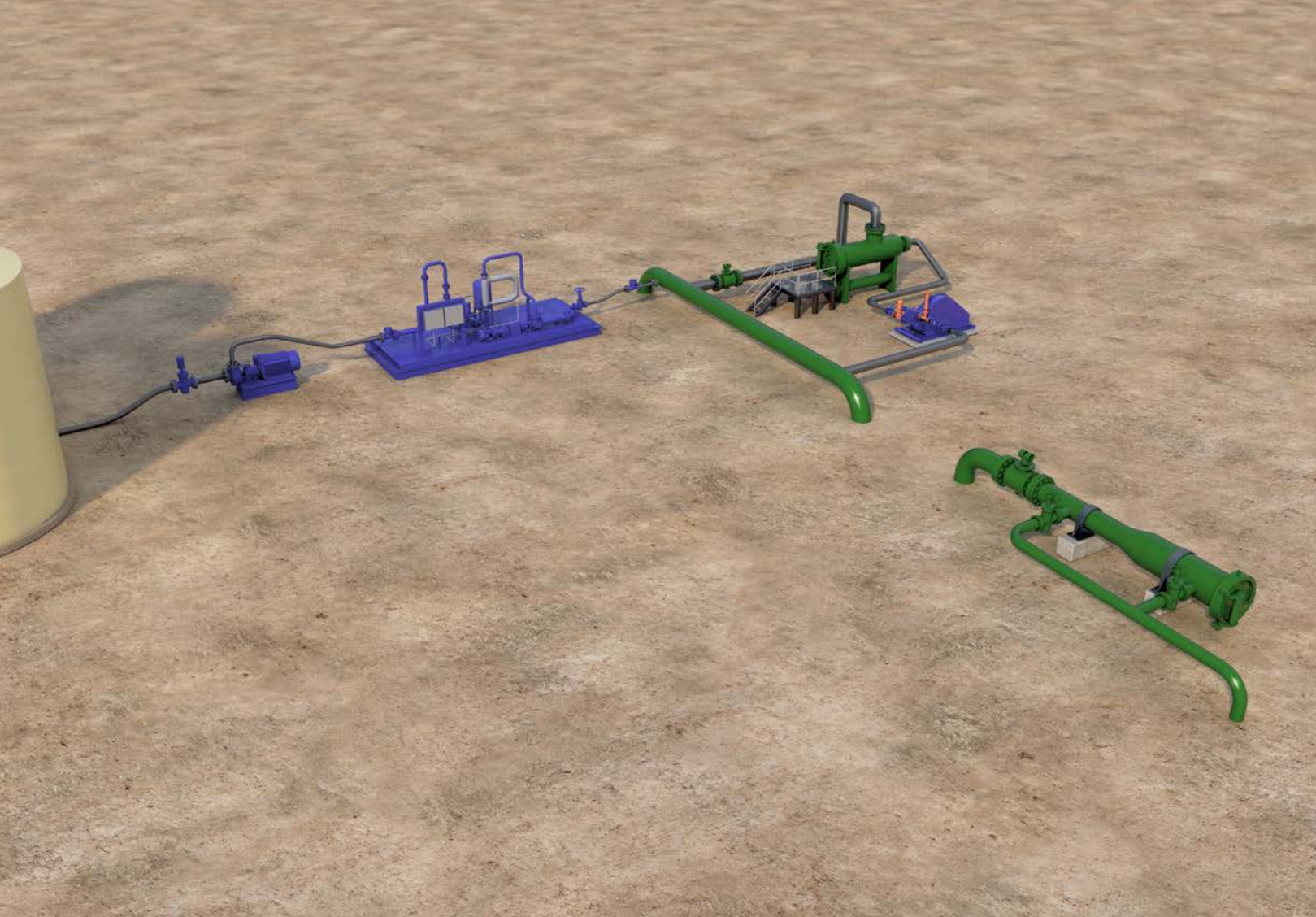
- Highly efficient using the best impeller technology and gearing
- Low horsepower requirements
- Complete uniformity and suspension of solids
- Sized effectively for optimal turnover rate avoiding air entrainment or solids from settling out
- Horizontal or vertical arrangements available



## High Shear Mixers (Greerco™)

- Inline technology that forces the entire fluid volume through the shear zone for better uniformity
- Reduces the number of mixing vessels and storage requirements by increasing production rates
- Axial in / Axial out configuration unique to Greerco equipment
- High mechanical reliability
- Low horsepower requirements





## Midstream

With over 65 years of manufacturing closures, as well as providing valves and pumps for the midstream industry, we have become an industry leader. Our Midstream division is a leading provider of API 6D valves, ASME "U" stamped quick opening closures as well as pumps and static mixers for LACT units to the oil and gas industry.

Our products are used throughout the global midstream distribution and transmission markets, these products include our gate valves, ball valves, plug valves, check valves, threaded closure, internal door closures, clamp style closures, static mixers, reciprocating and progressing cavity pumps.

We consistently provide safe, quality and reliable products to our customers.

## Closures (Yale™, Sentry™)

- True quick opening closures – typically less than 90 seconds
- Focus on safety and ease of operation
- Simple operation – no special tools required
- Sizes available – 2" through 74"
- ASME Boiler Pressure Vessel Code Section VIII, Division 1 and all applicable pipeline design codes compliant



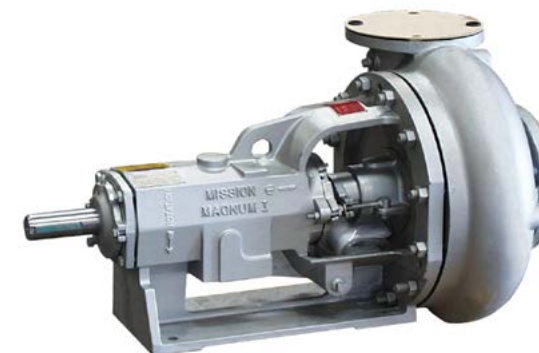
## Valves

- Sizes available 2" through 42"
- Pressure classes 150, 300, 600, 900, 1500, 2500
- API 6D and ANSI certified
- Operate from -50°F to 550°F (-46°C to 287.8°C)
- Our products and services include:
  - Expanding Gate & Plug Valves
  - Slab Gate Valves
  - Trunnion Mounted Ball Valves
  - Swing Check Valves
  - Aftermarket Services



## Centrifugal Pumps (Magnum™)

- Recessed impeller design
- Innovative features for a variety of routine and demanding applications including mine dewatering and use in rock quarries
- Capable of handling a wide range of flow rates up to thousands of gallons per minute



## Progressing Cavity Pumps (Mono™, Moyno™)

- Reliable performance in various midstream applications
- Varying fluid viscosity does not impact pump performance
- Quiet operation and no vibration
- Lower total cost of operation/ownership
- RV540 elastomer handles most abrasive O&G applications
- Up to 2,160 GPM capacity / 73,970 BPD
- Up to 900 psig differential pressures
- 14°F up to 320°F temperature
- Our products include:
  - 500 Series Pump
  - 2000 Series Pump
  - Compact C Pump
  - EZstrip™ Pump
  - LACT Units
  - Tank Recycle Process
  - Tri-Phase™ System



## Reciprocating Pumps (National™, Oilwell™, Gaso™, Wheatley™, Bear™)

- Positive displacement production pumps deliver high pressures with a small quantity of liquid
- The industry's largest array of single-acting quintuplex models available anywhere
- Used in booster pumps applications in pipelines
- Available as continuous and intermittent duty pumps in single-acting and double-acting models with input horsepower ranges from 2 to 2600



## Static Mixers (Kenics™)

- Low maintenance
- Guaranteed performance, uniform blending or dispersion
- Low pressure drop enhancing energy efficiency in compact lengths
- Mixers available in 316SS, CS, FRP, coated metals, PVC, PTFE and many others



## LACT Unit

- The pumps on this system provide low shear operation with a steady non-pulsating flow to accurately transfer hydrocarbons from the LACT meter to the pipeline owner
- This versatile pump system is effective in handling high pressure saltwater injection as well as high pressure oil pipeline injection applications
- An abrasion and chemical resistant stator for handling viscous liquids and random solids
- The static mixer provides a homogeneous mixture before reaching the flow meter



## Launchers and Receivers

- Provided in either ETO (engineered to order) or simple barrel launchers and receivers to meet customer specifications
- Build for reliability and ease of operation
- Build to ANSI standards
- Can be provided complete with API 6D valves, pig signalers, and either threaded, clamp style, or internal door closure to meet specific customer needs



# Industrial

We bring energy and integration expertise to strong brands that deliver high-quality, technology-driven equipment, services and support to various industries fundamental to our lives.

## Industrial



Mining/Minerals Processing



Chemical,  
Pharmaceutical, Petrochemical



General Industry



Environmental





## Environmental

Water treatment facilities utilize biological, physical and chemical processes to treat runoff water, human waste and industrial waste. For more than 75 years, our products have been effectively applied and widely used in these industrial and municipal wastewater treatment processes. We have continually enhanced the design and operational performance to be able to provide you with innovative, reliable packaged wastewater treatment solutions.

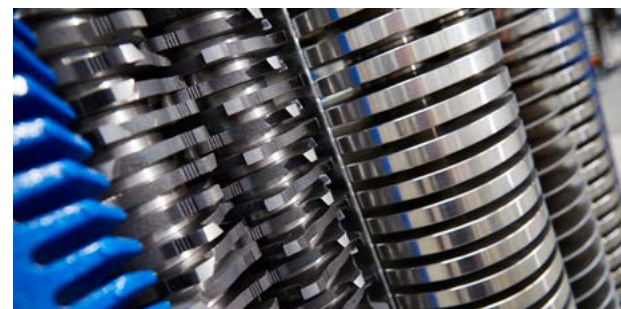
We provide an effective combination of products, process solutions and service support programs to keep plant operations running smoothly and efficiently with little downtime and minimal maintenance. We also have the ability to design custom product or solutions to fit your critical application requirements.

Since 1935 we have provided efficient and reliable fluid transfer to the wastewater industry using our progressing cavity pump. When packaged with our grinders, screens and macerators we provide a packaged solution to help you manage your solids and keep your pipework free of blockage and flowing freely.

Our agitators and static mixers are key components in any wastewater treatment process to ensure effective removal of chemical and biological contaminants prior to discharge into the environment.

### Screens

- High efficiency
- Self-cleaning
- Ideal for pump station, inlet works application
- Up to 70,446 gal/min



## Progressing Cavity Pumps (Mono™, Moyno™)

- Reliable operation
- Interchangeable components
- Pumps for polymer, dosing, high solids and sludge applications
- Extensive line of aftermarket and replacement parts
- Up to 4,500 gal/min
- Maintain-in-place technology available
- Temperatures as low as 14° F and as high as 230°F
- Up to 1500 psi
- Downhole pumps



## Grinders/Munchers

- Solids maceration
- Control particle size allowing for easy transfer
- Applications in sludge handling and solids reduction
- Up to 2,200 gal/min
- Maintain-in-place technology available



## Agitators (Chemineer™)

- Highly efficient using the best impeller technology and gearing
- Ragless impeller technology for processes that could have fibrous build-up in the impeller
- Low maintenance, highly reliable
- L-10 bearing lives exceeding 100,000 hours
- Optimal design solutions using proprietary design software specific to your process



## Static Mixers (Kenics™)

- Low maintenance
- Guaranteed performance, uniform blending or dispersion
- Low pressure drop enhancing energy efficiency in compact lengths
- Turbulent and laminar flow designs available
- Mixers available in 316SS, CS, FRP, coated metals, PVC, PTFE and many others



## Solar Pump Packages

- Surface and Submersible progressing cavity pumps
- Brushless DC motor built from 316 stainless steel
- Solar panels capable of providing up to 2800 Watts of power
- Solar controllers and accessories ensuring maximum efficiency and water output





## Chemical, Pharmaceutical, Petrochemical

These industries have a very broad spectrum of applications which means our products have to handle high viscosities, abrasives, toxic materials, non-Newtonian rheology and corrosives among others. They also have additional applications transferring and handling oil and gas by-products.

Our pumps are ideal for pumping shear sensitive materials. They are also used in metering applications for low flow, and high pressure encountering materials with viscosities as high as 1,000,000 cps. Our pumps can also operate at low speeds to maintain the characteristics of the product being pumped.

For applications like blending and motion, solids suspension, gas dispersion, and heat/mass transfer we have designed a diverse line of rotating agitators, static mixers, heat exchangers and high shear mixers specifically engineered to deliver reliable performance to the highest standards and achieve your process objectives.

### Static Mixers (Kenics™)

- Guaranteed performance
- Common Applications – blending, heat transfer, dispersions, plug flow reactors
- Sanitary designs – CIP, removable elements, polish, flanges
- Self-cleaning
- Sanitary static mixers available (3A certified / BPE compliant)



### Heat Exchangers (Kenics™)

- Uses static mixer technology for extreme efficiency
- Common Applications – heat transfer, reactors
- ASME code construction
- Customized design specific to your process
- Sanitary designs – CIP, removable elements, polish, flanges



## Chemical, Pharmaceutical, Petrochemical

### High Shear Mixers (Greerco™)

- Full scale and laboratory sizes available
- Common Applications – deagglomeration, dispersions, rapid mixing, emulsions
- High mechanical reliability
- Axial in / Axial out configuration
- Repeatable performance
- Sanitary designs – polish, flanges, washdown motors, stainless steel base



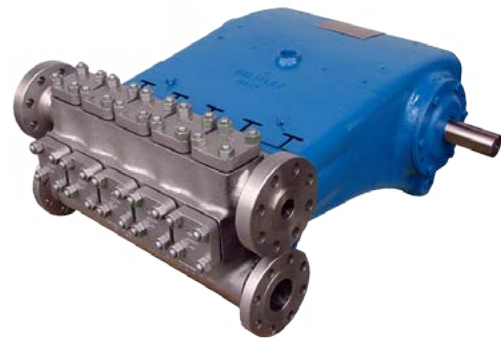
### Agitators (Chemineer™)

- Top, side and bottom entry units available
- Common Applications: blend tanks, reactors, mass/heat transfer, fermentation
- Most efficient gas dispersion impeller available
- FDA and USDA options available
- Sanitary designs – CIP, polish, couplings, seals, flanges



## Reciprocating Pumps (National™, Oilwell™, Gaso™, Wheatley™, Bear™)

- Positive displacement production pumps deliver high pressures with a small quantity of liquid
- The industry's largest array of single-acting quintuplex models available anywhere
- The world's largest pump distribution network
- Available as continuous and intermittent duty pumps in single-acting and double-acting models with input horsepower ranges from 2 to 2600



## Progressing Cavity Pumps (Mono™, Moyno™)

- Reliable operation
- Interchangeable components
- High degree of accuracy and control
- Available with chemically resistant and hygienic materials
- Capable of handling solids approaching 40%
- Up to 990 gal/min
- Maintain-in-place technology available



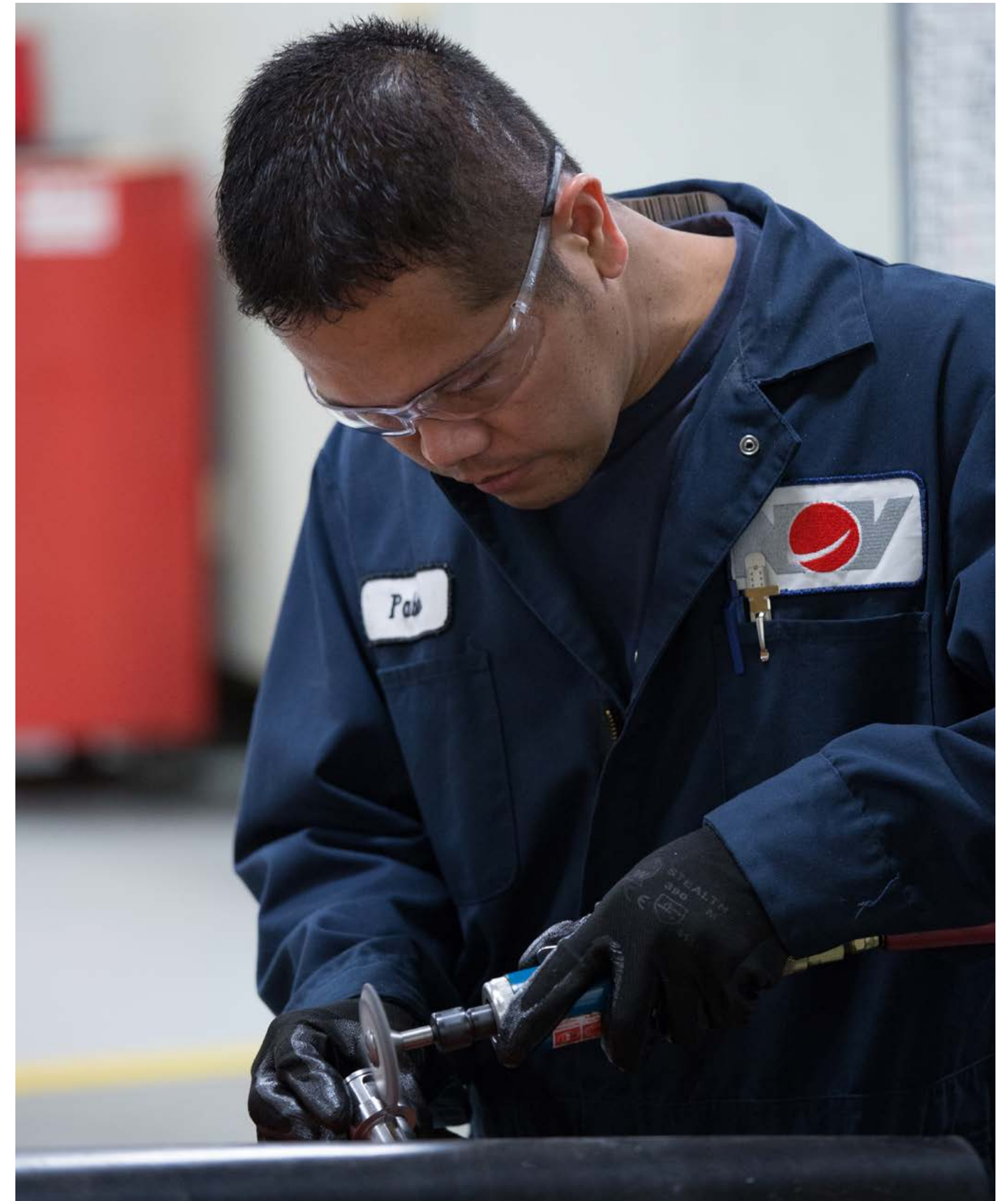
## Solids Handling (Tore™)

- Our patented Tore technology generates a unique vortex, fluidizing the solids immediately around it
- The Tore conveys solids at slurry concentrations of up to 70% by weight
- A 1" Tore can transport up to 4 tons per hour of sand and a 2" tore, 16 tons
- Can also be used as a highly efficient mixing device



## Grinders/Munchers

- Solids maceration to prevent pump or pipework blockage
- Ideal for filtration and recycling systems
- Up to 2,200 gal/min
- Maintain-in-place technology available





## Mining/Minerals Processing

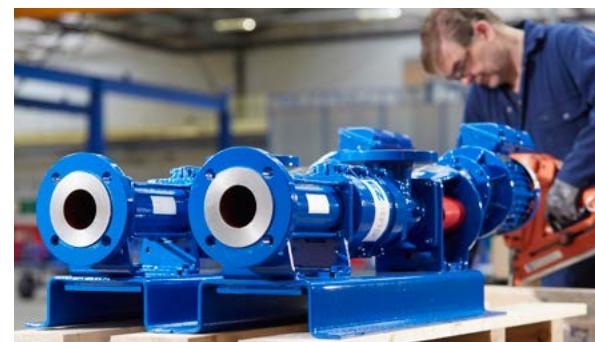
The mining industry places high demands on the products designed to keep it operating. Mining minerals like gold, silver, copper and coal is challenging, and so is processing them. We've designed our products for application in explosives, mine dewatering and mineral processing. You can rely on our products in the harshest conditions, delivering the consistent performance you need.

Our pumps have been engineered to handle varying viscosities, and highly abrasive materials such as mineral slurries, thickened sludges, waste water and drilling muds. We also have extensive experience producing mine dewatering packages to fit the needs of our customers.

Various applications throughout mineral processing require mixers of varying complexity. Mixers are used in autoclaves, solvent extraction and throughout general purpose areas of the facility. We have an extensive product breadth to be able to design for the general purpose mixers, as well as, the high pressure, high temperatures and harsh nature of the autoclaves. Our industry leading drive, impeller, static mixer and heat exchanger technology allows us to design and optimize the best solution for your process.

### Progressing Cavity Pumps (Mono™, Moyno™)

- Range of pumps including EZstrip™ Transfer, Compact Range, X Range, LF Range, and CP Range
- For the following applications: Flocculants, Explosives, Polymers, Oil & Water Separation, Mine Dewatering
- Extensive line of aftermarket and replacement parts
- Power efficient



### Agitators (Chemineer™)

- Custom designs specific to your application and metal
- Unlimited sizes for shafts and impellers
- Efficient, rugged and low maintenance
- Variety of impellers for optimization and wear resistance
- Common Applications: autoclaves, attack tanks, leaching, CIP/CIL



### Static Mixers (Kenics™)

- Continuous processing
- Low maintenance
- Guaranteed performance
- Common Applications –blending, heat/mass transfer, water treatment



### Heat Exchangers (Kenics™)

- Uses static mixer technology for extreme efficiency
- ASME code construction
- Removal of thermal gradients
- Customized design specific to your process
- Common Applications –explosive emulsions, heat transfer



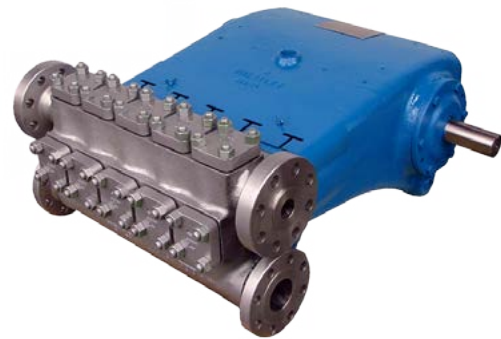
### Mining Skid Packages

- Highly efficient, fully integrated pump package solution for reducing the total cost of a mine dewatering operation
- 6-7 hour maintenance operation changing out rotor and stator reduced to 1 hour
- Reduction in maintenance time by up to 80%
- Eliminates dismantling lengths
- Optimal safety to maintenance staff i.e. no working at height or under hoppers
- No packed glands, belts or pulleys to maintain
- 3 pumps to fit in same station footprint



## Reciprocating Pumps (National™, Oilwell™, Gaso™, Wheatley™, Bear™)

- Positive displacement production pumps deliver high pressures with a small quantity of liquid
- The industry's largest array of single-acting quintuplex models available anywhere
- The world's largest pump distribution network
- Available as continuous and intermittent duty pumps in single-acting and double-acting models with input horsepower ranges from 2 to 2600



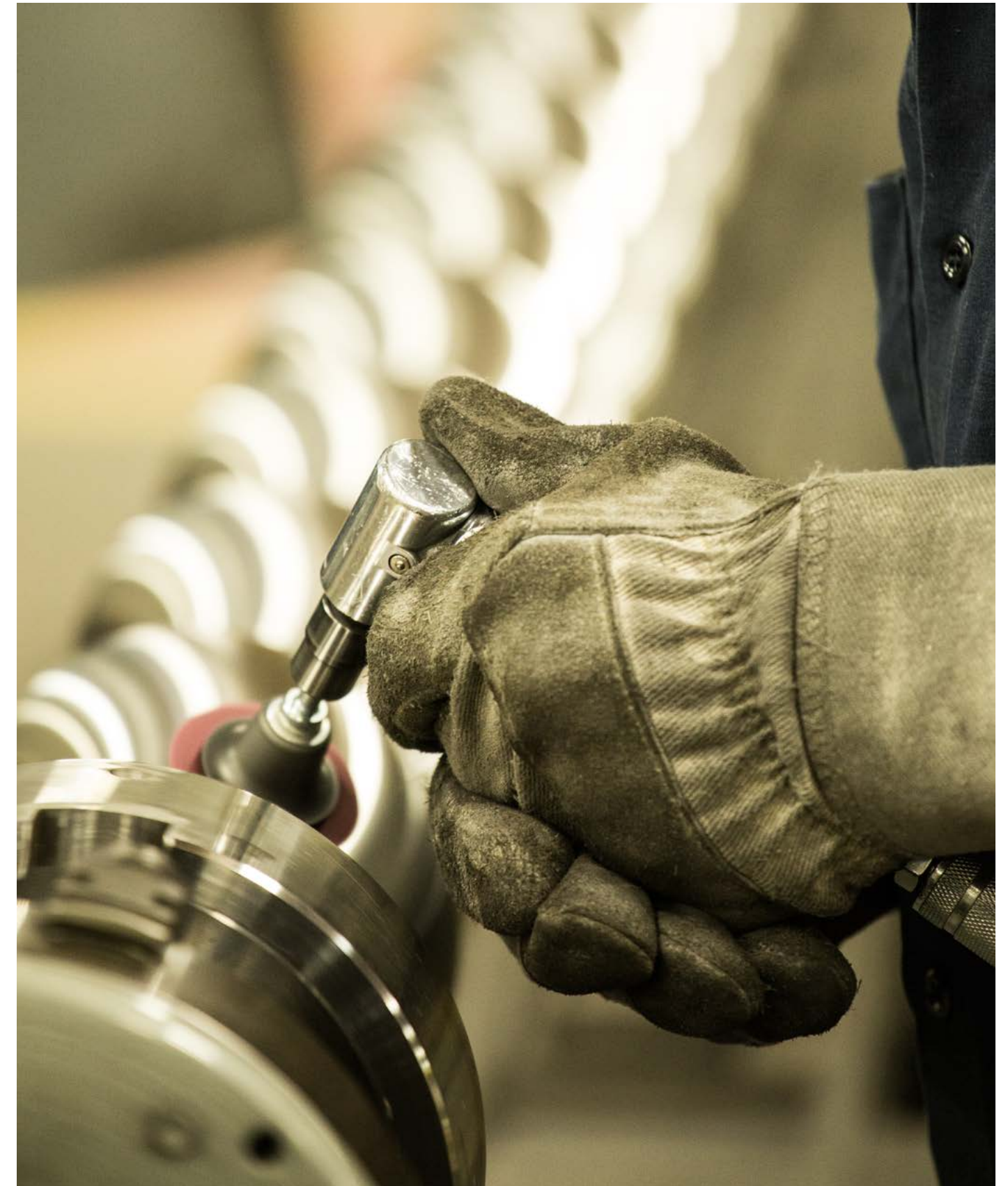
## Solids Handling (Tore™)

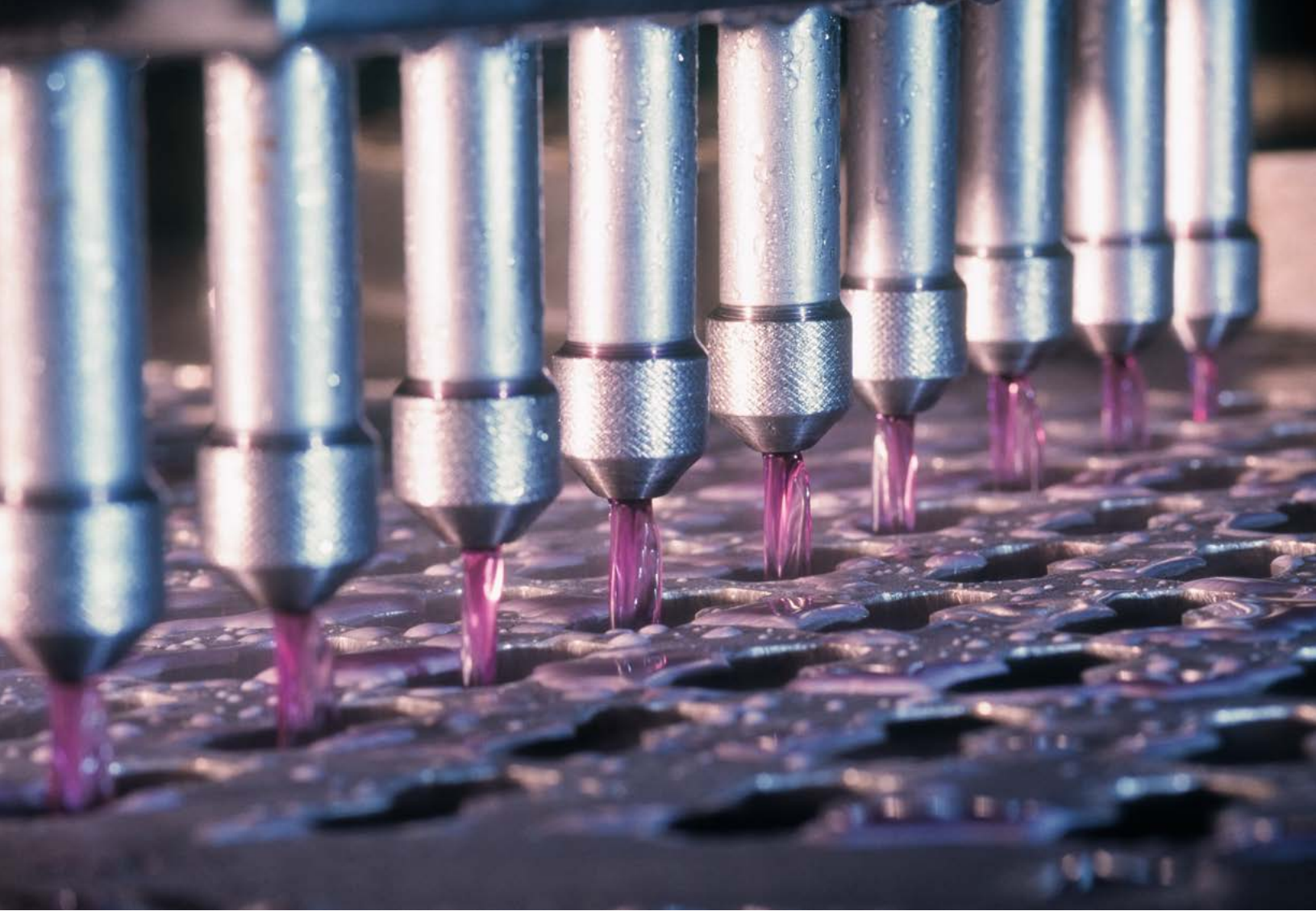
- Our patented Tore technology generates a unique vortex, fluidizing the solids immediately around it
- The Tore conveys solids at slurry concentrations of up to 70% by weight
- A 1" Tore can transport up to 4 tons per hour of sand and a 2" tore, 16 tons
- Can also be used as a highly efficient mixing device



## Centrifugal Pumps (Magnum™)

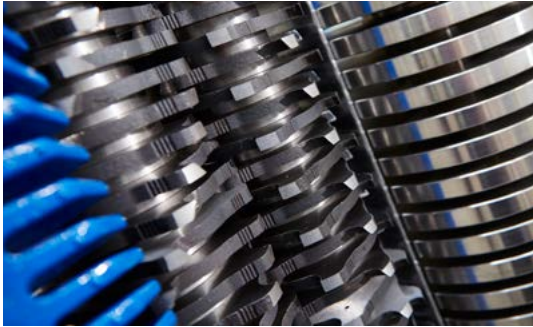
- Recessed impeller design
- Innovative features for a variety of routine and demanding applications including mine dewatering and use in rock quarries
- Capable of handling a wide range of flow rates up to thousands of gallons per minute





### Screens

- High efficiency
- Self-cleaning
- Ideal for pump station, inlet works application
- Up to 70,446 gal/min



### Grinders/Munchers

- Applications in Food & Beverage, Pulp & Paper
- Up to 5,315 gal/min
- Maintain-in-place technology available



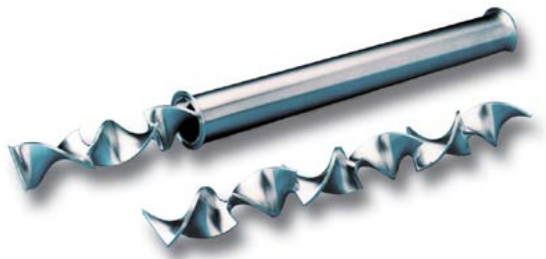
### Agitators (Chemineer™)

- Full line of impeller technology for optimization of your process
- Top, side and bottom entry agitators available
- Quick and easy seal change out
- Efficient, rugged and low maintenance
- Proprietary gearbox design, manufactured and tested by Chemineer
- Materials of Construction: CS, 316SS, C276, Alloy 2205 – other alloys, coverings and coatings available
- Common Markets (not already mentioned): Pulp and Paper, Food and Beverage, Corn Processing, Water and wastewater treatment, Adhesives, Paints/Inks, Cosmetics



### Static Mixers (Kenics™)

- Continuous processing
- Low maintenance
- Guaranteed performance
- Laminar, transitional and turbulent flow applications
- Materials of Construction: CS, 316SS, C276, Alloy 2205 – other alloys, coverings and coatings available
- Common Markets (not already mentioned): Pulp and Paper, Food and Beverage, Corn Processing, Adhesives, Paint/Inks, Cosmetics



## General Industry

When it comes to general industry applications virtually every one of our products plays a role in at least one of the industries listed below. We are constantly adapting and customizing our existing product line to find additional applications, and integrating these products into packaged systems. Whether it's changing materials, product specifications or simply augmenting the operating parameters, we can provide a solution for countless applications across many industries.

If your process calls for a pump, screen, grinder, heat exchanger, agitator or mixer, we can provide a reliable solution to fit your needs.

Applications include:

- Agriculture
- Food & Beverage
- Pulp & Paper
- Fermentation
- Ethanol/Biodiesel
- Bio Technology
- Flue Gas Desulfurization
- Corn Wet Milling
- Solar

### Progressing Cavity Pumps (Mono™, Moyno™)

- Applications in Agriculture, Food & Beverage, Pulp & Paper, Biogas
- Extensive line of aftermarket and replacement parts
- Maintain-in-place technology available
- Capable of handling solids



## Heat Exchangers (Kenics™)

- Uses static mixer technology for extreme efficiency
- ASME code construction
- Handles extreme viscosities and high pressures
- Customized design specific to your process
- Common Markets (not already mentioned): Food and Beverage, Adhesives, Cosmetics, Polymers



## Side Entry Mixers (Prochem™)

- Belt driven side entry designs
- Most efficient side entry impeller available
- No need to drain the tank for maintenance with the tank shut off feature
- Variety of sealing options
- Common Markets (not already mentioned): Corn Processing, Pulp and Paper, Oil and Gas Storage



## High Shear Mixers (Greerco™)

- Robust rotor / stator design
- Axial in / Axial out configuration for lower horsepower requirements
- Process is directed through the mixing head eliminating any chance of bypassing the shear zones
- Rental options available
- Common Markets (not already mentioned): Food and Beverage, Corn Processing, Adhesives, Paint/Inks, Cosmetics



## Reciprocating Pumps (National™, Oilwell™, Gaso™, Wheatley™, Bear™)

- Positive displacement production pumps deliver high pressures with a small quantity of liquid
- The industry's largest array of single-acting quintuplex models available anywhere
- The world's largest pump distribution network
- Available as continuous and intermittent duty pumps in single-acting and double-acting models with input horsepower ranges from 2 to 2600



## Solar Pump Packages

- Surface and Submersible progressing cavity pumps
- Brushless DC motor built from 316 stainless steel
- Solar panels capable of providing up to 2800 Watts of power
- Solar controllers and accessories ensuring maximum efficiency and water output





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