SUBMERGED MOTOR
CRYOGENIC PUMPS

4661 Eaker Street, North Las Vegas, NV 89081 USA
Phone: 1 702 643 4900 • Web: www.NikkisoCryo.com
NIKKISO CRYO, INC., is one of the world’s foremost suppliers of submerged motor liquefied gas pumps, offering unmatched reliability, quality and safety.
As part of the Nikkiso Company global organization, our “original technologies” provide our customers with the confidence in knowing they are receiving the latest technology and the highest standards of engineering available.

Located in North Las Vegas, Nevada, in the USA, Nikkiso Cryo offers a full range of submerged pumps for LNG, LPG, LEG, LN2, liquid propylene and many other liquefied gases.

With design, production and test facilities in both the USA and Japan, sales offices in Las Vegas, Houston, London and Tokyo, Nikkiso Cryo offers prompt and full support for all of our customers worldwide.
Nikkiso Cryo is committed to continuous improvement of our products and services and to meet or exceed the requirements of our customers. It is through this commitment that Nikkiso Cryo has developed a reputation as a loyal and trustworthy supplier producing a quality product known for its high reliability.

**QUALITY IS THE FOUNDATION ON WHICH EVERYTHING WE DO IS BASED; FROM THE TIME WE FIRST INTERACT WITH OUR CUSTOMERS WE STRIVE TO ACHIEVE THE HIGHEST LEVEL OF QUALITY POSSIBLE.**

Our internal corrective action system helps assure that any lessons learned are immediately corrected not only for the current project, but in all of our internal systems to ensure all future processes and designs are as trouble-free as possible.

We believe that quality is a continuous process that requires us to never stop trying to improve.
With the motor submerged in the pumped fluid, where no oxygen is present during operation, the submerged motor pump design provided by Nikkiso Cryo provides the highest level of safety.

The design uses a common shaft between the motor and the pump section that removes the need for a rotating seal, which eliminates the possibility of hazardous gases leaking into the atmosphere.

In addition, the terminal header, which provides connections for the power cables to penetrate through a static seal from the pumped fluid to the external conduit section, is certified for use in hazardous areas for the safest installation possible.
Nikkiso Cryo is proud of our strong reputation for integrity – earned through our Technical Partnership approach that increases peace of mind for our customers.

We enjoy a history of meeting specifications as well as delivering on time and on budget.

Our Project Engineering leadership allows for seamless integration of Nikkiso Cryo equipment with our customers’ operating systems.

Nikkiso Cryo offers ongoing service and support after installation, from monitoring pump operating condition, to field service and maintenance.

At maintenance time, we work with you to determine the proper overhaul plan and provide skilled personnel for technical assistance at the site.

We offer a unique condition monitoring service that reduces cost through longer, more efficient operating life and strategically planned maintenance.

Each customer is assigned a dedicated Project Manager for consistent, individualized care.
FIXED IN-TANK PUMP

This pump type is mounted directly to supports in the bottom of a storage tank, and connected to a discharge pipe which extends to the top of the tank and out to the discharge piping.

This simple and low cost design is primarily used in liquefied gas carriers and in any other application where removing the liquid from the tank for maintenance is a normal or required process and can be accomplished without excessive costs to the tank or system.

This design is ideal for smaller, horizontal storage tanks providing a totally submerged pump and motor that has no bottom penetrations providing a safe, leak-free installation.
SUCTION VESSEL MOUNTED

This design is provided with the pump and suction vessel which become an integral part of the piping system with external suction and discharge connections. The pump is mounted to the top or headplate of the vessel such that the pump, motor and fluid product are totally contained within the pressure vessel.

Shaft seals are eliminated. The pump inlet is below the suction vessel inlet which allows the source tank liquid levels to be lowered to a minimum.

The suction vessel also serves to allow entrained vapors to be separated and go through the vent line of the vessel and not into the pump. Removal of the pump requires only that the suction and discharge valves be closed with subsequent purging of the suction vessel. The pump is then removed by unbolting the top flange.
REMOVABLE (IN-TANK)

Removable, or in-tank pumps offer the advantage of overhead removal and installation without taking the tank out of service. The pump operates at the bottom of a purpose-built pump column through which it is installed and removed. The column provides the fluid discharge from the pump to the top of the tank and contains the lifting cables as well as the power cables.

When lowered into position, the pump is seated on a conical seat in the suction or “foot” valve at the bottom of the column. The weight of the pump opens the spring loaded foot valve, allowing the pumped fluid to enter the pump inlet where it is then pumped to the top of the column and out through the discharge piping.

When the weight of the pump is removed, the foot valve closes, and the column can be purged and the pump safely removed. This design eliminates the need for piping connections below the tank liquid level for a very safe installation.
As a supplier of submerged motor pumps operating in hazardous environments, Nikkiso Cryo has extensive experience in the selection and design of the proper electrical components to ensure a safe and certified system. These systems can be purged with nitrogen gas to remove moisture from the boundary section between cold and warm, and the purge gas pressure can also be monitored to determine if leakage exists. Electrical systems are supplied to meet plant specifications as well as US, European and any other international codes as required. The systems supplied by Nikkiso Cryo are of the highest quality and are fully tested prior to shipment to ensure the highest level of reliability.
VIBRATION SYSTEMS

As a result of Nikkiso Cryo’s research and development and through our Aftermarket Service organization, operating personnel can be trained to interpret data acquired from the condition monitoring system. Nikkiso Cryo’s research and extensive experience allows for correlation of monitoring specific vibration modes with specific operating and wear conditions. Condition monitoring and trend analysis has the potential to provide more complete diagnostic information on an operating pump than physical inspection of the disassembled pump. This facilitates optimum timing of maintenance considering factors of reliability, operation and costs. Condition monitoring permits scheduling maintenance only when essential and indicates the need for immediate maintenance to prevent outages and loss of production.

Ultimately, condition monitoring saves money through longer, more efficient pump life and strategically planned maintenance. The feedthroughs and instrument junction boxes supplied on the pumps to enable the cables to pass through from the vessel or tank to the outside are selected and designed for use in the hazardous areas where the pumps are installed for a safe and reliable installation. The system supplied can be monitored with most monitoring systems for display in plant control rooms for trend monitoring and machine diagnosis.

Monitoring Pump vibration is an excellent means to determine pump condition. However, this is particularly challenging for submerged motor cryogenic pumps which have no exposed surfaces or shaft for making direct measurements from the outside of the containment vessel. Nikkiso Cryo can supply piezoelectric accelerometers designed for use directly submerged in the pumped liquid, mounted on the pump housings, and can also locate accelerometers on the outside of suction vessel mounted pumps to provide monitoring of pump vibration. These sensors can measure pump acceleration vibration directly and, with signal conditioning, provide velocity and displacement amplitude data. The condition of internal parts and the extent of wear can be determined by trend monitoring and frequency analysis.
STATE OF THE ART INDUCERS SPECIALLY DEVELOPED BASED ON HIGH SPEED INDUCER TECHNOLOGY FROM THE AEROSPACE INDUSTRY TO ALLOW THE PUMPS TO REDUCE LIQUID LEVELS TO EXTREMELY LOW LEVELS

For pumps operating in liquefied gases, where pressures and temperatures of the pumped fluid are sometimes near their boiling point, the use of inducers in the pump inlet is necessary to ensure adequate NPSHR (Net Positive Suction Head Required) is supplied to the main centrifugal impellers. Nikkiso Cryo uses low solidity “fan” type inducers as well as high solidity “spiral” type inducers depending on the application. These inducers, with high suction specific speeds, provide excellent low suction pressure performance over a wide flow range.

For applications which require tank levels to be minimized as much as possible, Nikkiso Cryo has developed a spiral inducer with very high suction specific speeds. Our ZEN™ (Zero Enabled NPSH) inducer was specially developed based on high speed inducer technology from the aerospace industry to allow the pumps to reduce liquid levels to extremely low levels, which maximizes usable tank volume.
Nikkiso Cryo pumps include an automatic axial thrust balancing mechanism which utilizes pressure to produce zero net thrust loading on the bearings. This is accomplished with a variable, axial orifice which controls the pressure entering the balance drum. Fluid enters into the variable orifice onto the lower face of the balance drum producing “lift” of the rotating assembly.

The balance drum outer clearance provides a fixed orifice which reduces the pressure as it passes through to the upper surface. During operation, the variable orifice adjusts automatically until the two pressures above and below the balance drum reach equilibrium, which results in very stable and reliable operation with no thrust loads on the bearings throughout the entire flow range. During performance testing of Nikkiso Cryo pumps, axial shaft position is measured to assure the system is balanced and no load is being taken up by the bearings.
Nikkiso Cryo offers performance testing at full speed, power and flow using LNG, LPG or LN2 at our facility in Las Vegas, Nevada, or using LN2 at our facility in Tokyo, Japan. The pumps undergo rigorous testing throughout the flow range, with flow, pressure, motor power and many other measurements taken using calibrated systems to ensure compliance with project requirements.

NPSH as well as complete pumpdown can be measured as well as axial shaft position to ensure the thrust balance system is performing as designed.

Testing is performed to very strict Nikkiso Cryo standards in addition to API, ASME and other international standards and project requirements. Factory performance testing ensures that each and every pump meets exacting standards and provides trouble-free performance once it has been installed and is operating at the customer’s site.

As a result of unique design features that control bearing loads and our multiple bearing technology, Nikkiso Cryo pumps provide unparalleled reliability. In many cases, mean time between overhauls exceeds 20,000 hours, with some pumps recording more than 40,000 hours!
GLOBAL SERVICE

Our services include:
- Installation, commissioning and repair
- Technical training
- Spare parts management
- Engineering, failure analysis

With field service staff located in the USA and Japan, and with the support of our factory engineering staff, Nikkiso Cryo is focused on responding to all service needs with a sense of urgency and commitment. We recognize that downtime at our customers’ sites results in losses of productivity and revenue, and we strive to provide the most prompt and efficient service possible.

Our experienced Aftermarket Services Group can provide all of your service needs, with supervisory services from initial installation, commissioning, maintenance, repairs and training, to assist with spare parts management and operational procedure review.

INNOVATION

• Exclusive horizontal assembly process for large, multistage high pressure pumps, reducing the need for specialized pump maintenance facilities at the job site.

• Multiple bearing technology for multistage high pressure pumps to ensure rotor dynamic stability and unsurpassed reliability.

• Pioneer of first high pressure vaporizer feed pumps for FSRU’s with more marine and offshore high pressure pumps built than any other competitor by far.

• Specially developed ZEN™ spiral inducers to provide extremely low pumpdown characteristics.

Find out more at: www.NikkisoCryo.com or call directly us at: 1 (702) 643-4900
QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RANGE  TESTING  QUALITY  RELIABILITY  STABILITY  EXPERIENCE  VALUE  INNOVATIVE  GLOBAL  FSRU & FLNG  FULL RAN