



PRE COOLING MRI @ GotraCRYOTECH'S

GotraCryotech's is a Pune based leading service provider of Pre Cooling MRI magnets. We are a full-scale solutions provider for both domestic and international clients.

Pre-Cooling Problems

During MRI pre-cooling process, several losses can occur like helium loss due to evaporation or leakage, time loss impacting scheduling and productivity, energy loss increasing operational costs, cooling efficiency loss affecting MRI system stability, financial loss from excessive helium use, and diagnostic loss compromising image quality and patient care. Optimizing the pre-cooling process through maintenance, calibration, and advanced techniques is crucial to minimize losses, improve MRI efficiency and enhance patient care in the MRI department.

Solution

Pre-cooling the MRI with us offers efficient cooling, expert handling, helium availability, reduced downtime, quality control, cost-effectiveness, and safety compliance, ensuring optimal performance and smooth installation in the healthcare facility. Most Importantly, Pre-cooling with GotraCryotech's reduces the risk of Magnet Quench, resulting in time and cost savings, and promoting environmental sustainability.

GotraCryotech's, India's first private MRI pre-cooling plant, can significantly reduce these risks, ensuring smoother, safer, and cost-saving MRI procedures.

Pre Cooling process flow

Pre-cooling MRI magnets is crucial for optimal imaging, reducing electrical resistance and improving image quality. However, cryogenic cooling systems pose certain risks. Using GotraCryotech's, India's first MRI pre-cooling plant, can significantly reduce these risks, ensuring smoother, safer, and cost-saving MRI procedures. Always consult experts and consider GotraCryotech's for reduced quench risk when working with cryogens. Take a quick look at how GotraCryotech's works with pre-cooling your MRI:

- ☐ INSURANCE
- ☐ VACCUM
- ☐ HELIUM LEAK DETECTION TEST
- ☐ TRADITIONAL VS MODERN PRE-COOLING
- ☐ RAMP UP & RAMP DOWN
- ☐ MONITORING SYSTEM
- ☐ TRANSPORT

The MRI magnet consists of a cryostat, which is a container that houses the superconducting coils. The cryostat is designed to maintain a vacuum environment to minimize heat transfer and keep the superconducting coils at their required low temperatures.



To create a vacuum inside the cryostat, a vacuum pump is used to remove air and other gases. The pumping process evacuates the cryostat, creating a low-pressure environment.

At GotraCryotech's, we have a specialized vacuum process to bring the vacuum level to its maximum strength. The MRI system's vacuum components and seals are inspected and maintained to ensure long-term vacuum integrity. GotraCryotech's manufactures these seals at its own facility.

Cryogen Purity Analysis: Impurities in the cryogens, such as moisture or contaminants, can degrade the performance of the superconducting coils. At GotraCryotech's we conduct cryogen purity analysis to ensure the cryogens remain pure and free from impurities.

Helium Leak detection Test

Helium mass spectrometry is a highly sensitive method for detecting very small leaks in the cryogenic system of an MRI machine. Regular leak detection using this method is crucial to ensure the efficient and safe operation of the MRI equipment, as helium leaks can lead to decreased cooling efficiency, magnet quench, and potential downtime for repairs. Additionally, stringent safety protocols are followed during the leak detection process to minimize the risks associated with handling helium gas.

Helium leaks in MRI machines can occur due to various reasons, and addressing them promptly is essential to maintain the proper functioning of the equipment and ensure safety.

The specific process for helium leak detection in MRI machines involves the following steps:

1. **Routine Inspections:** Regular inspections of the MRI system and its cooling components are conducted to check for any signs of leakage, such as pressure drops or temperature fluctuations.
2. **Helium Mass Spectrometry:** Helium mass spectrometry is a sensitive method used to detect helium leaks. It involves injecting a small amount of helium tracer gas into the MRI system and using a mass spectrometer to analyse the surrounding area for the presence of helium.
3. **Sniffing Probe or Vacuum Probe:** There are two main types of helium mass spectrometry leak detection methods that GotraCryotech's uses. The first method involves using a "sniffing probe," where the mass spectrometer probe is moved around the suspected areas to detect helium leakage directly. The second method involves creating a vacuum in the system and monitoring the mass spectrometer for any helium ions indicating leaks. If helium ions are detected by the mass spectrometer, it indicates the presence of a helium leak. The intensity of the signal and the location of the leak can help identify the severity and location of the leak.
4. **Locating and Repairing Leaks:** Once a leak is detected, further investigation is performed to pinpoint the exact location of the leak. This may involve visual inspections, pressure testing, or other methods. After locating the leak, appropriate repairs are carried out to address the issue and prevent future leaks.

Traditional Pre-cooling VS Modern Pre-Cooling

TRADITIONAL PRE-COOLING

The traditional pre-cooling process with nitrogen for an MRI involves gradually cooling the magnet components by introducing liquid nitrogen into the cryostat. The steps are summarized as follows:

1. Initial checks and safety measures are performed to ensure the MRI machine is ready for pre-cooling.
2. The magnet is vented to allow warm air to escape from the cryostat.
3. Liquid nitrogen is introduced into the cryostat, and as it vaporizes, it absorbs heat from the magnet components, gradually cooling them down.
4. The nitrogen is allowed to soak in the cryostat, further reducing the temperature of the magnet components.
5. The soak period may be repeated with fresh liquid nitrogen to continue the cooling process.
6. The temperature of critical components is monitored throughout the process.
7. After sufficient cooling which is a process of 3 to 4 days, the cryostat is evacuated and filled with liquid helium, the primary cryogenic coolant.
8. The magnet is stabilized at the desired operating temperature, ensuring it remains in its superconducting state during MRI scans.
9. Calibration and quality assurance tests are performed to ensure the magnet's optimal performance.

MODERN PRE-COOLING

MRI magnets without the risk of helium loss is achieved at GotraCryotech's facility by using a closed-cycle customised cryogenic system, also known as a HE-Cryocooler. Unlike open-cryostat systems that require liquid helium for cooling, closed-cycle cryogenic systems operate in a closed loop, making them much safer and eliminating the risk of helium loss.

Here's how Closed-cycle HE-Cryocooler works: Closed-cycle HE-cryocoolers use a refrigeration process that does not rely on continuous replenishment of cryogens like liquid helium. Instead, they use a cycle of compression, expansion, and heat exchange to maintain a stable and low temperature inside the MRI magnet. Magnet will get precooled by this and we understand that the liquid required to pre-cool the magnet will be consumed in less quantity.

Which also means that we will pre-cool the magnet directly from helium vapours, bringing the temperature down to 65K to 70K, and there will be no chances of impurity in the magnet because we are pre-cooling without nitrogen liquid. This saves time and money both, and rightly justifies the statement, 'TIME IS MONEY'

RAMP UP & RAMP DOWN PROCESS

Ramping up and ramping down an MRI magnet refers to the controlled process of gradually increasing (ramp up) or decreasing (ramp down) the magnetic field strength of the superconducting magnet. This process is typically done during the initial setup of the MRI machine, after maintenance, or when moving the MRI system.



ADVANTAGES OF PERFORMING THEM @ GOTRACRYOTECH'S FACILITY

Ramping up the MRI magnet at the GotraCryotech's facility offers several advantages. By using specialized equipment and expertise, GotraCryotech's can ensure a controlled and safe ramp-up process, reducing the risk of quenching and potential financial losses due to any damage that might occur during the first ramp-up attempt.

Ramp Up: During the ramp-up process, the magnetic field strength of the superconducting magnet is gradually increased to its operational level. This is done to ensure that the magnet safely reaches the desired magnetic field strength without experiencing a sudden transition from the superconducting state to a resistive state (quench).

Reduced Risks of Quench: A quench occurs when the superconducting magnet transitions to a resistive state, resulting in the release of stored energy as heat. Quenching can lead to temperature spikes and potential damage to the magnet and other components. It is essential to avoid quenching during the ramp-up process.

Wait Period After the ramp-up process: there is a wait period of 24 hours to allow the magnet to stabilize at its operational magnetic field strength. This waiting period ensures that the magnet remains in its superconducting state without any unexpected fluctuations before further use.

Ramp Down: The ramp-down process involves gradually reducing the magnetic field strength of the superconducting magnet. This is typically done when the MRI machine is ready to be moved to its final destination.

By choosing to have the ramp-up & ramp-down process done at the GotraCryotech's facility, there is an added layer of safety and expertise, which can help minimize financial risks up-to 40% and ensures the optimal performance of the MRI magnet.

TRANSPORT

Developing a specialized transport facility with all the necessary provisions for securely transporting MRI systems to their final destination is a valuable and forward-thinking initiative. The potential helium losses during transit can be a concern for MRI facilities, and your transport solution addresses this issue by ensuring the magnet remains adequately cooled and operational during transportation. Here are the key features and benefits of our transport facility.

Secure Transportation: The on wheels facility designed specifically for MRI systems ensures safe and secure transportation, minimizing the risk of damage to the equipment during transit.

Helium Loss Mitigation: By providing a transport facility equipped with a generator, servo stabilizer room, chiller, and a person to top up diesel at regular intervals, we significantly reduce the risk of helium losses during transit. The continuous cooling and stable power supply help maintain the superconducting state of the magnet throughout the journey.

On-site Support: Having a person accompany the vehicle ensures that any necessary assistance, topping up of diesel, or troubleshooting can be promptly addressed during transportation.



Efficient Positioning: The provision for unloading the equipment and positioning it at the final site further streamlines the installation process, reducing downtime and ensuring the MRI system is ready for use as quickly as possible.

Customer Satisfaction: Our comprehensive transport solution reflects our commitment to providing a seamless experience for our clients, enhancing customer satisfaction and confidence in our services.

Value-added Service: Offering specialized transport services tailored to the unique needs of MRI systems demonstrates our dedication to providing value-added solutions for our clients.

Overall, your transport facility with all the necessary features and provisions exhibits a customer-centric approach, ensuring the safe and efficient transportation of MRI systems while addressing helium preservation concerns. By providing end-to-end transport services, GotraCryotech, offers a comprehensive solution that not only simplifies the logistics but also instills confidence in our clients, making us a preferred partner for MRI facilities.

INSURANCE

Insuring each system and its associated equipment upon arrival at GotraCryotech's facility is a responsible and prudent measure. Insurance provides valuable protection against potential risks and uncertainties during the handling and storage of valuable MRI systems. Here are some key benefits of providing insurance for the systems.

Risk Mitigation: Insurance helps mitigate the financial risks associated with potential damage, loss, or theft of MRI systems and their components while they are under GotraCryotech's care.

Peace of Mind: Clients sending their MRI systems to GotraCryotech can have peace of mind knowing that their equipment is covered by insurance, providing reassurance in the event of any unforeseen incidents.

Professionalism and Trust: Offering insurance coverage showcases professionalism and accountability on the part of GotraCryotech. It demonstrates a commitment to taking responsibility for the equipment and ensures trust between GotraCryotech's and its clients.



Protection during Handling: During transportation, loading, unloading, and positioning, there's always a risk of accidental damage. Insurance coverage provides protection in case of any mishaps during these processes. **Business Continuity:** In case of any adverse events, insurance coverage helps GotraCryotech's manage potential losses, allowing the business to continue its operations smoothly without significant financial setbacks.

Client Satisfaction: Providing insurance coverage demonstrates a commitment to customer satisfaction and care for clients' valuable assets. It enhances the overall client experience with GotraCryotech's services.

GotraCryotech's collaborates with a reputable insurance provider to ensure customized coverage for the stored and transported MRI systems, promoting safety, security, and client satisfaction, showcasing GotraCryotech's commitment to providing valuable and comprehensive solutions.

MONITORING SYSTEM

Providing clients with a system to monitor their magnet's precooling process at GotraCryotech's facility is an exceptional commitment to transparency and customer satisfaction. This level of openness and accessibility is valuable for MRI facility operators who want to have real-time visibility into the status of their valuable equipment. Here are the benefits of offering such a monitoring system.

Real-Time Monitoring: The monitoring system allows clients to have real-time access to critical data about their magnet's precooling process. They can track the cooling progress, temperature levels, and other relevant parameters remotely.

Client Empowerment: By providing a monitoring system, GotraCryotech's empowers its clients to stay engaged and informed throughout the precooling process. Clients can actively participate in ensuring the successful precooling of their MRI magnet.

Transparency and Trust: Offering a monitoring system reflects GotraCryotech's commitment to transparency and builds trust with its clients. It demonstrates that GotraCryotech's is confident in its precooling processes and is willing to share Realtime information.

Proactive Intervention: If any anomalies or deviations occur during the precooling process, clients can take prompt action and work with GotraCryotech's to address the issues proactively.

Peace of Mind: MRI facility operators can have peace of mind knowing that they have direct access to observe and verify the precooling process remotely.

Enhanced Customer Experience: The monitoring system enhances the overall customer experience by providing clients with more control and involvement in the precooling process.

Collaboration and Support: The monitoring system encourages collaboration between GotraCryotech's and its clients. If any questions or concerns arise during the process, GotraCryotech's can provide immediate support and guidance.



This customer-centric approach sets GotraCryotech's apart, enhancing its reputation as a leading provider of MRI magnet precooling services with a strong focus on transparency and client engagement.

Thank you for your interest in GotraCryotech's. Your work/project holds paramount importance to us.. Looking forward to exceptional partnership and support in future collaborations.

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THANK YOU

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