

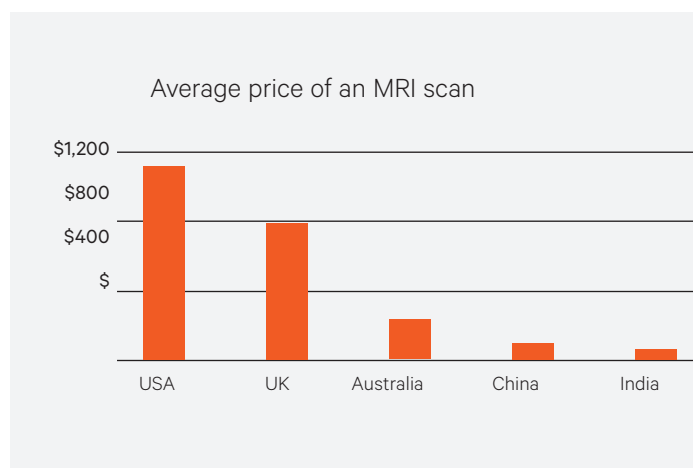
# Alternate cooling solutions for MRI centers: Overview and Cost Analysis



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*Diagnostic Imaging business in India is a largely fragmented industry and running an MRI service as a successful business requires more than just generating high quality images. To build or expand an MRI business, cost control is of paramount significance.*

Cost control is more important for India based diagnostic businesses, as the price of medical services in India are lower than global rates. Hence, diagnostic imaging center owners need to find solutions which can reduce their operating costs without compromising quality.



## *Importance of using the right cooling technology*

As per a COCIR<sup>1</sup> study, quality of the images generated by an MRI is directly related to the magnetic field strength i.e. more powerful magnetic fields and amplifiers enable images with less noise and higher resolutions. Hence, it is imperative for diagnostic imaging centers to consider energy savings from allied equipment/infrastructure.

Apart from an MRI machine, its cooling equipment is a significant energy guzzler. Inappropriate cooling can lead to

low quality images and frequent system shutdowns. Abrupt shutdown scenarios can result in severe software malfunctions which would reduce medical equipment's longevity and increase the servicing expense. As currently little research exists comparing different cooling technologies in the Diagnostic Imaging space, below we have attempted to compare different available cooling solutions.

<sup>1</sup> European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry

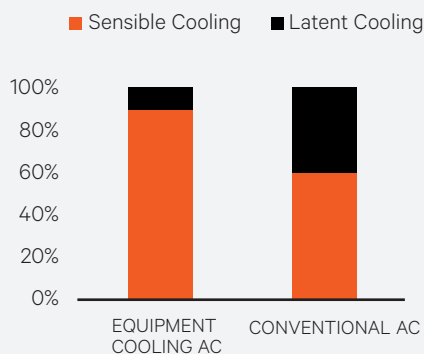
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## Conventional vs Equipment Cooling

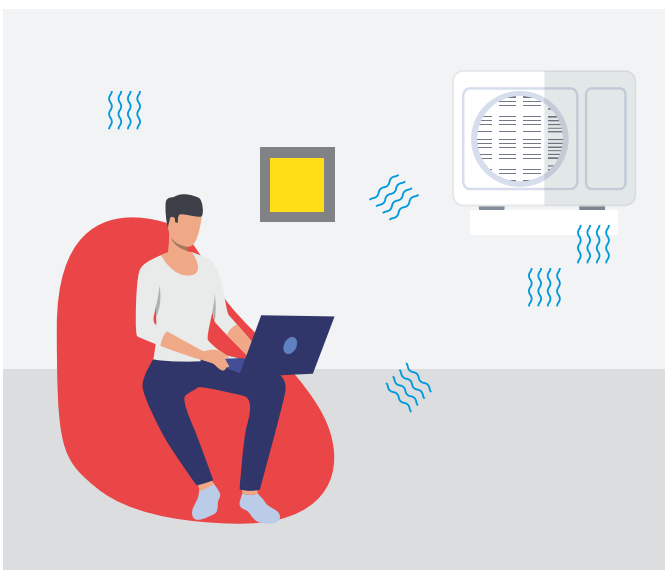
- Total Heat can be divided into two components, Sensible (accounts for temperature change) and Latent (accounts for change in the phase of a substance)

### Your critical diagnostic equipment needs 'Sensible' Cooling

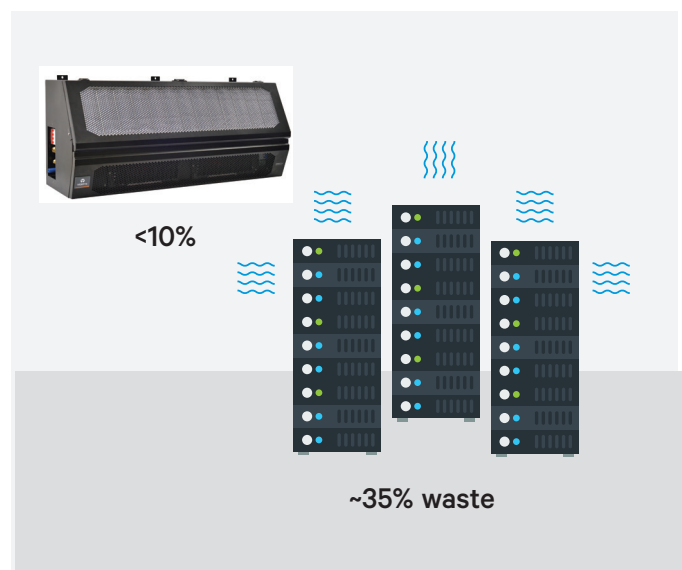


- The cooling requirements of equipment are limited to the sensible components, contrary to human cooling wherein heat is also dissipated in the form of perspiration (latent heat from sweat to water vapours)
- Conventional ACs are designed to address human comfort that deals with both Sensible + Latent heat. When they are used for equipment cooling, the latent component of heat absorbed (~35% of the total cooling requirement) is actually not required.
- On the other hand, equipment cooling solutions, are specifically designed for cooling critical equipment such as MRI, CT scanner, etc.
- It is very crucial to choose the right cooling solution for a specific application to leverage the technological advancements in specialization.

### Conventional Cooling



### Equipment Cooling



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## Performance comparisons in a 1.5 Tesla MRI setup

- Our study has factored in typical equipment heat output from operating a 1.5 Tesla MRI
- Conventional split AC, VRF, and Equipment Cooling solutions are considered as viable cooling alternatives. For Equipment Cooling Solution, we have used SRC (Small Room Equipment Cooling) solution from Vertiv

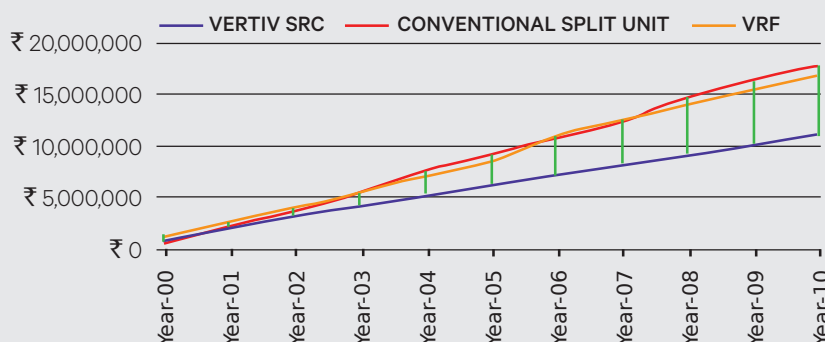
Equipment	Heat Output per hour
Water Chiller for BRM Body Coil	13,993 btu
Blower Box	3,412 btu
1.5 Tesla LCC Active Shield Magnet	8,190 btu
RFS Cabinet	27,071 btu
HFD/PDU Cabinet	34,129 btu
RF Penetration Panel Covers	324 btu

- A holistic view has been considered while computing Total Cost of operations (TCO) by considering annual power requirement, CAPEX of cooling equipment and the operating cost.
- A 10-year operation cycle has been considered to factor in long term viability.

- Our study reveals significant benefits on using Vertiv SRC: **Total Cost Saving of up to ₹54 Lacs\* compared to Conventional Split system and ₹47 Lacs\* compared to VRF system**
- Our calculations do not factor in frequent downtime associated with conventional AC and replacement cycle disruptions. If these are quantified, **benefit of Vertiv SRC will be higher as SRC is designed for 24x7 operation for 10-12 years**, while conventional AC and VRF would have comparatively lower life
- Payback period for additional cost of SRC over Conventional ACs is ~20 months, while over VRF it is ~12 months
- The TCO 10-year Graph [Refer Graph 1] depicts that the **benefits from energy savings of SRC units more than offsets the higher cost of SRC within the first 2 years of operation.**
- Cost benefits from Vertiv SRC are further boosted as Conventional ACs and VRF might require frequent periodic replacement due to wear and tear.
- In 10 years' time, Vertiv SRC will have generated net cost savings of up to ₹54 lacs\* due to its energy efficiency (i.e. focused equipment cooling methodology) and a prolonged life-span.

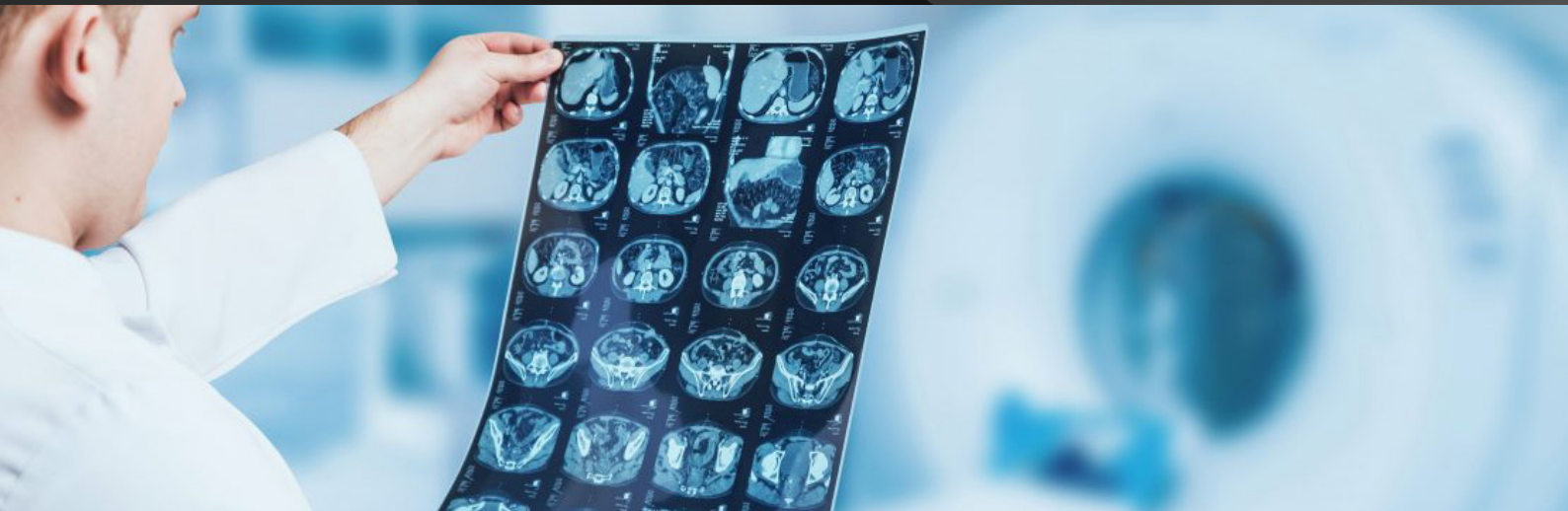
TOTAL COST OF OWNERSHIP OVER 10 YEARS

COST OF OWNERSHIP



\*Results will depend upon existing setup, location, and hours of operations

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## MICRO-PROCESSOR CONTROLLER

Equipped with features like

- Sequencing up to 8 units
- Monitoring & alarm generation
- User-friendly interface
- Auto-startup on power failure
- Remote monitoring feature
- Authorized access control



## EASY MAINTENANCE & SERVICE

- Self diagnostic feature in the controller
- Ease of access to critical components for service



## HIGH AMBIENT OPERATION

- Condenser designed to operate up to 48C ambient temperature
- Hydrophilic coating on coil protects it from hazardous environment
- Safety cut-outs provided for fail-safe operation



## PROVEN SERVICE & SUPPORT

- 24 hours customer help center
- Quick response time
- Global presence with experienced personnel



## EFFICIENT COOLING SYSTEM

- Capacity: 1.2 TR, 2 TR and 3 TR
- New and advanced coil design with a higher airflow delivering High SHR > 0.9
- Efficient scroll compressor along with R407C refrigerant

