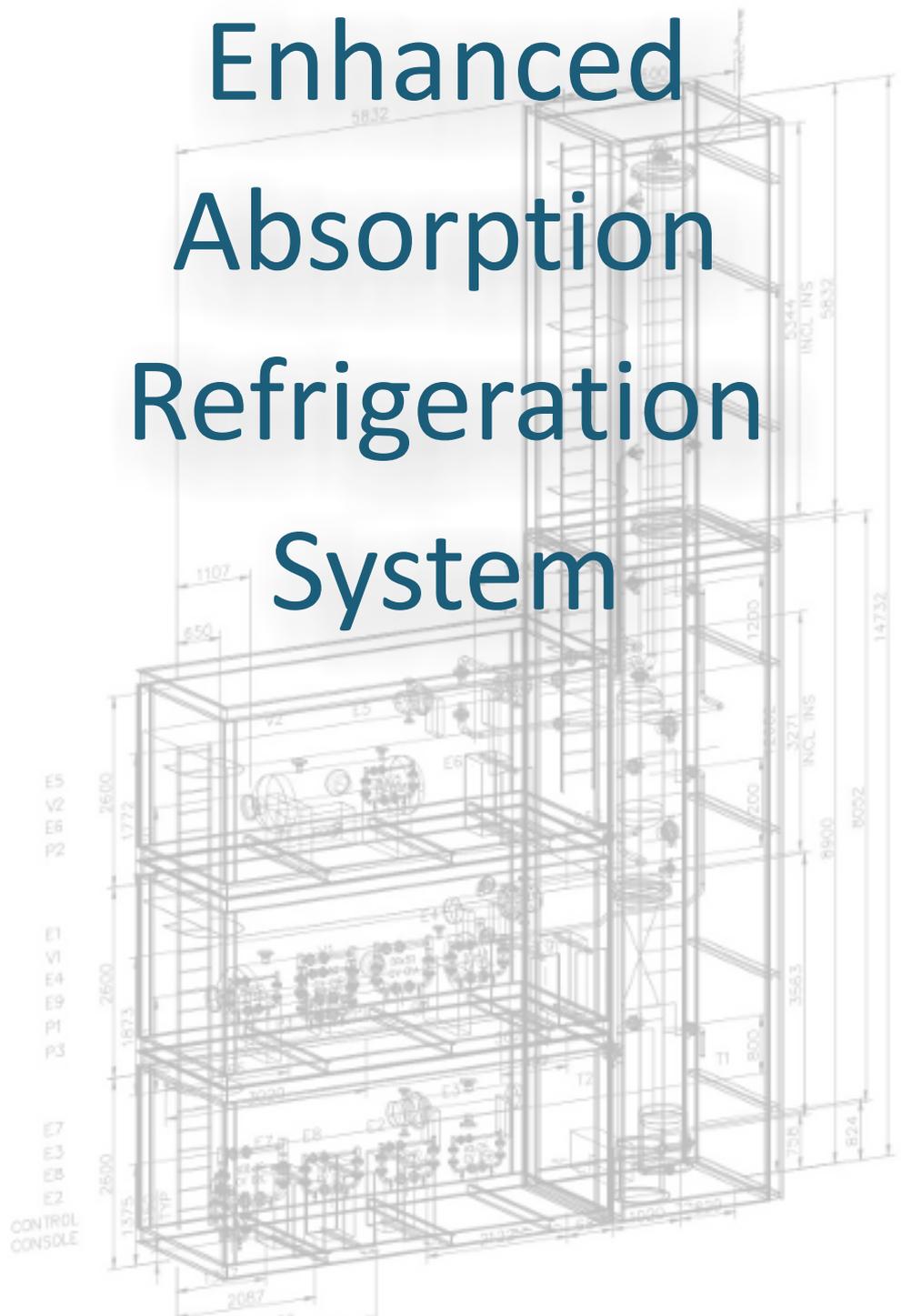




Enhanced Absorption Refrigeration System



EARS™

Efficient Absorption Refrigeration is now a Reality

A New Era for Ammonia Absorption Refrigeration

Sunengen's Enhanced Absorption Refrigeration System (EARS™) delivers thermally generated cooling into the mainstream for large scale applications. Refrigeration from heat has traditionally been limited by low efficiency and large sizes. With industry-leading performance, simple operation, and fast ROI, EARS™ is changing the game...

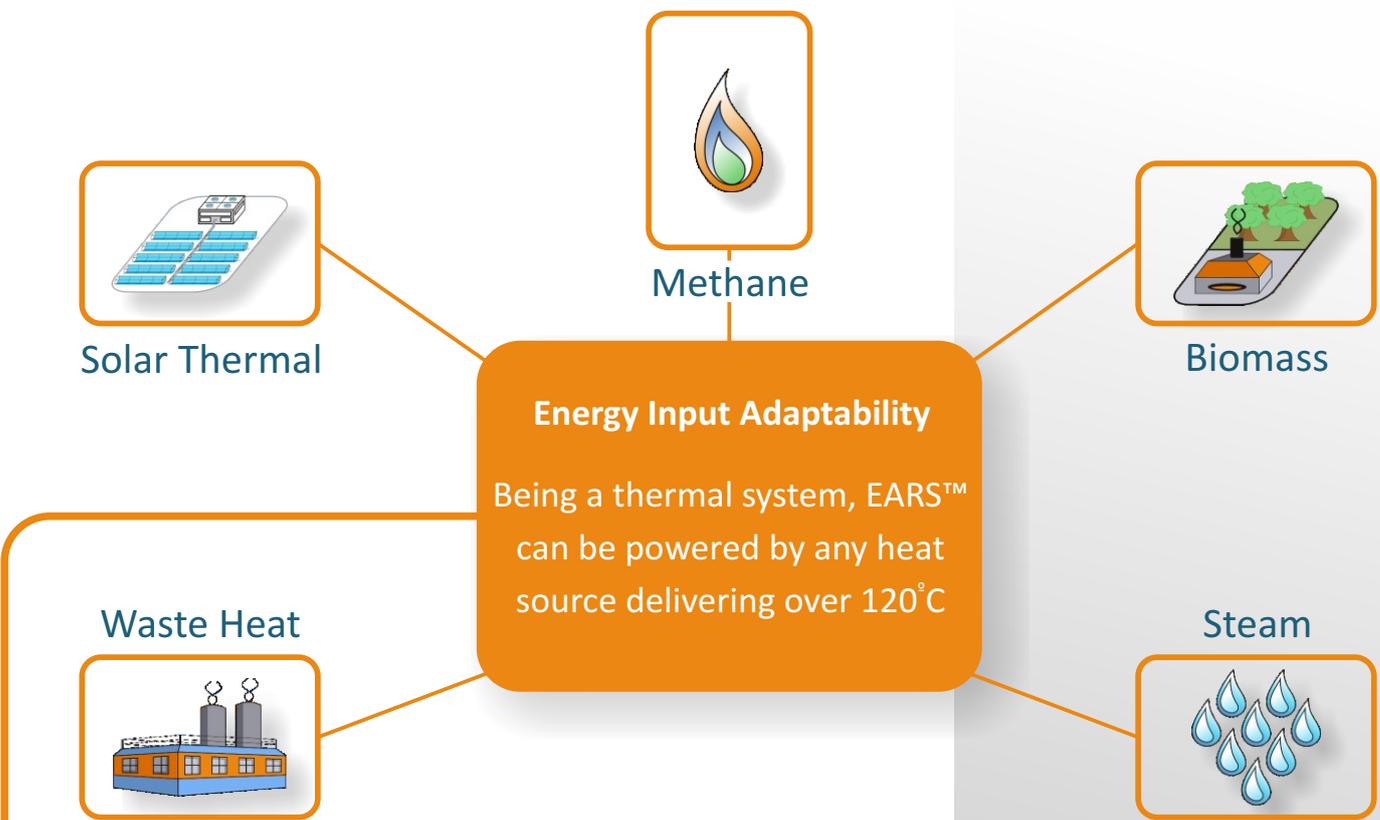
Application Enabling Efficiency

Whether you're harnessing waste heat, looking to expand your capacity, or even looking to cut grid dependence through solar or renewable fuels, EARS™ makes it all possible.

Scalable Plant Optimised for Your Needs

From 500kW to 50MW, Sunengen has the skills and experience to deliver you the EARS™ system you need for your operation.





Why EARS™?

The patent-protected EARS™ process can best be described as a hybrid system, and incorporates a number of novel design approaches adopted from the Oil and Gas industry to deliver a CoP of 0.96; approximately one-and-a-half times that achievable from the competition.

In an ammonia absorption refrigeration cycle, heat energy drives a vaporisation-absorption cycle to generate cooling, allowing the use of alternative energy sources like waste-heat, biomass, or even solar energy. The electric compressor of conventional refrigeration systems is replaced by a "thermal" compressor, made up of the generator, absorber, pump, and heat exchanger, and it is this system which determines the potential of the technology, measured as Coefficient of Performance (CoP).

EARS™ incorporates three key innovations to drive up the CoP :

- The use of a pre-saturator maximises the approach to ammonia saturation in the first absorption stage, capitalising on the thermodynamic principle of Heat of Absorption to minimise energy input.
- The addition of a pump to increase the pressure of the ammonia/water mix to enable complete absorption to take place, so reducing the overall volume of refrigerant required for a given duty.
- The ammonia regenerator is a high-efficiency fractionating column incorporating both rectifying and stripping sections. The rectifying section ensures that the ammonia refrigerant purity obtained is greater than 99.9% purity so that the corresponding vaporising temperature remains constant over its vaporisation range.

EARS™ across multiple industries

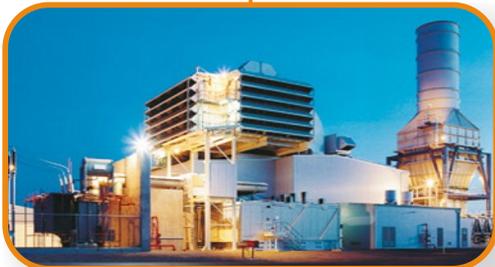


Mobile Refrigeration

By using waste-heat, EARS™ can augment traditional cooling systems with up to 20% additional capacity for no extra fuel costs, slashing operating costs for grid-remote operations.

Shipping

Sunengen is working with a leading European ship-builder to incorporate exhaust-fired EARS™ and cut the use of expensive, polluting, heavy fuel oils for power generation to drive on-board cooling.



Gas-Turbine Inlet Cooling

Powering EARS™ with waste exhaust gas provides cost-effective opportunities for substantial increases in both turbine operating efficiencies and available power output.

Mine Cooling

With options including waste-heat harvesting, methane capture, and even large-scale solar for grid-independence, EARS™ is driving down the cost of cooling for deep-mining operations



Petroleum Refining

There are multiple opportunities for the implementation of EARS™ in refining, with one feasibility study to harness existing steam supplies boosting propylene recovery with a 12 month ROI...

Pharmaceutical and Food industries

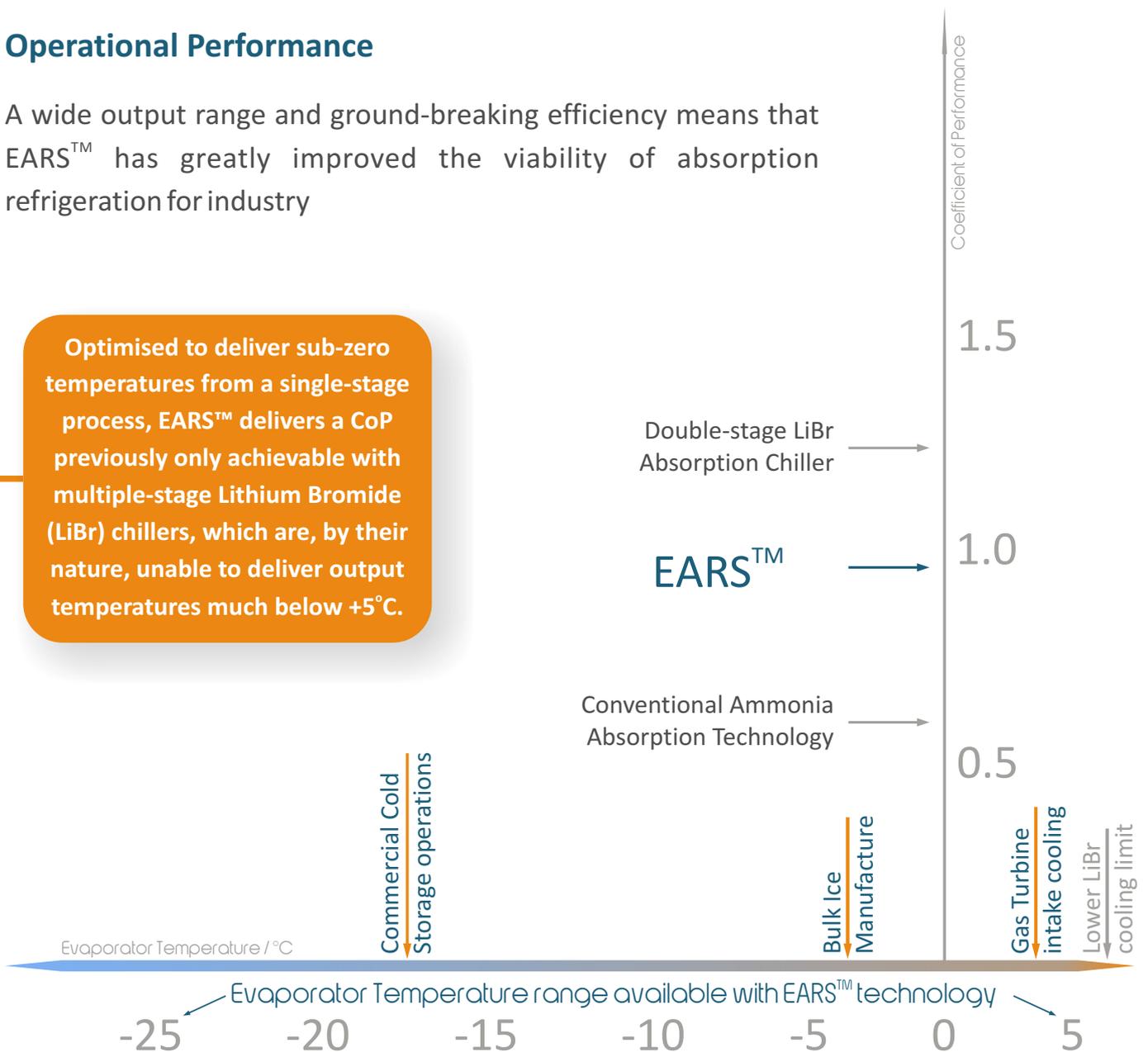
The performance of EARS™ increases the opportunity for the integration of process heat and cooling, critical to efficient operations, and impacting directly on the bottom line.



Operational Performance

A wide output range and ground-breaking efficiency means that EARS™ has greatly improved the viability of absorption refrigeration for industry

Optimised to deliver sub-zero temperatures from a single-stage process, EARS™ delivers a CoP previously only achievable with multiple-stage Lithium Bromide (LiBr) chillers, which are, by their nature, unable to deliver output temperatures much below +5°C.



Engineering Services

We pride ourselves on our constructive and collaborative approach to contract administration, which draws on our extensive experience and skills. As a multi-discipline engineering consultancy we are able to manage, monitor and appraise the key design and construction works applicable to new-build, conversion, refurbishment and upgrade projects for the implementation of EARS™ across a wide variety of sectors.

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