

Trox Design Bureau®

CO₂RAC

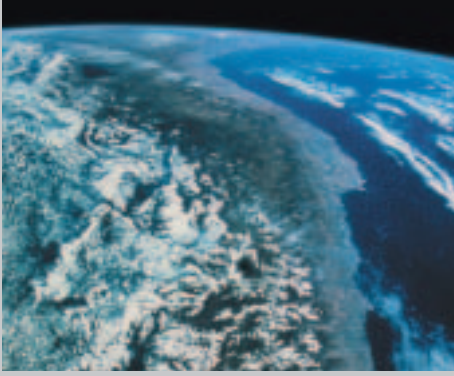
Blade server cooling



TROX® **TECHNIK**

The art of handling air





System Engineering



The Trox Design Bureau has over 50 years of experience in Building Services around the world, with a reputation for providing innovation, comfort and safety.

The Design Bureau's experience of system engineering has been gained across diverse sectors:

- I.T. Infrastructure*
- Commercial offices*
- Healthcare*
- Education*
- Hotel & Leisure*
- Laboratories*
- Infrastructure*

The extensive R&D facilities have been the backbone for innovative value engineering of cooling, ventilation and integrated lighting systems:

- I.T. Cooling*
- Multi-service chilled beams*
- Fan coil and diffusers*
- VAV and diffusers*
- Labcontrol*
- Decentralised ventilation*
- Filtration*





Rising I.T. loads

Blade Server Cooling

The introduction of blade servers into the world of I.T. has brought an exciting challenge to the providers of I.T. cooling. The use of this cutting edge I.T. equipment demands a resilient cooling solution that can deal with intensive heat loads efficiently, cost effectively and within the confines of the available plant space.

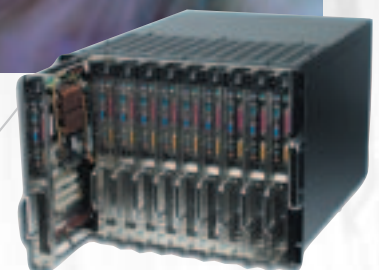
Blade server heat loads are dramatically higher than those ever experienced previously; their heat load is dependant on their power supply:

Description	Power Supply / Heat Load		
Power supply per blade chassis	4 x 1200 W	4 x 1400 W	4 x 1800 W
Heat load per blade chassis	2820 W	3256 W	4000 W
Heat load per 42-U cabinet	16.92 kW	19.536 kW	24 kW

Conventional solutions employing air and water are widely recognised to be at their practicable limits, unable to deal with the intensive loads that this technology is placing upon them.

The reluctance of the I.T. world to utilise water due to the ever incumbent issues of combining 'water-electronics' often sidelines this option.

The use of air, which has long been the staple for the cooling technicians, is impractical when the heat loads necessitate effective hourly air change rates of up to 5000 in the cold aisle. The ideal of fully loaded 'blade' cabinets cannot be realised when the internal environment is too inhospitable for IT operatives to undertake their essential tasks.





Carbon Dioxide



The Trox Design Bureau in collaboration with its partner Star Refrigeration, has developed a cooling solution specifically for blade server cooling harnessing carbon dioxide, an abundant natural substance that is considered environmentally neutral.

Pressurised carbon dioxide in its liquid form, used as a secondary refrigerant, is an ideal cooling medium for intensive heat gain applications including blade server cooling. The primary cooling system refrigerant is designed to suit the project and will typically utilise R134a for smaller installations and may use ammonia for larger projects.

The key physical properties of carbon dioxide include:

- ▶ *Electrically benign and is not hazardous to I.T. hardware*
- ▶ *Volatile substance; the heat is absorbed during a 'phase-change' process with no rise in temperature*
- ▶ *Increased heat capacity over air and water combined with its reduced viscosity, allow a lower consumption of pumping power, resulting in energy savings*

The concept of using carbon dioxide to provide cooling is not a new one for building services as the use of the technology dates back to the 1930's. The food industry is a more recent user, with the likes of Asda and Nestle adopting CO₂ in their cold stores. The automotive industry, often the source of new initiatives into the world of building services, already uses carbon dioxide in its air conditioning systems.



Turnkey Solution

Collaborative Design

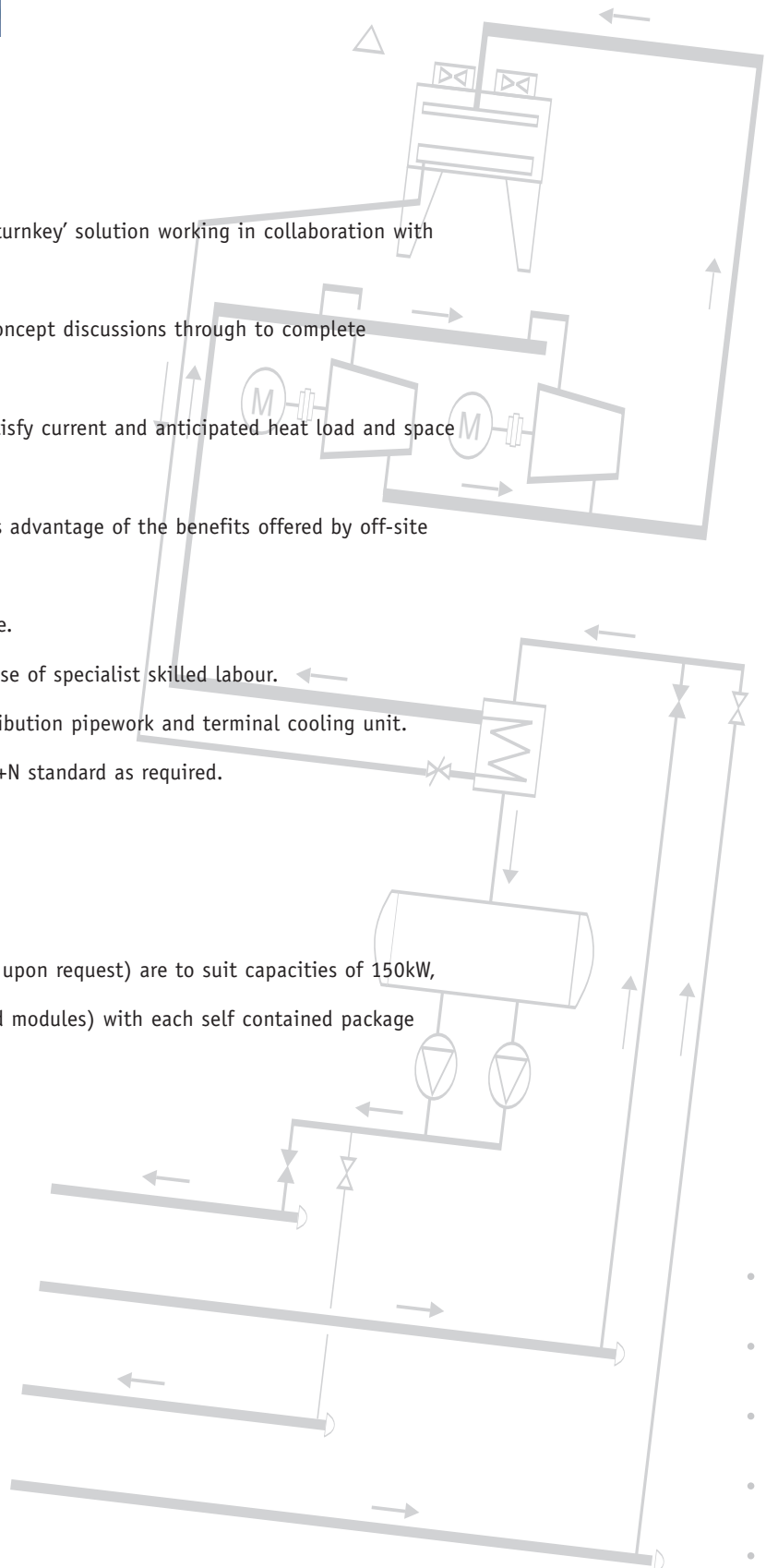
The Trox Design Bureau offers a fully integrated 'turnkey' solution working in collaboration with the Client and his Design Team to:

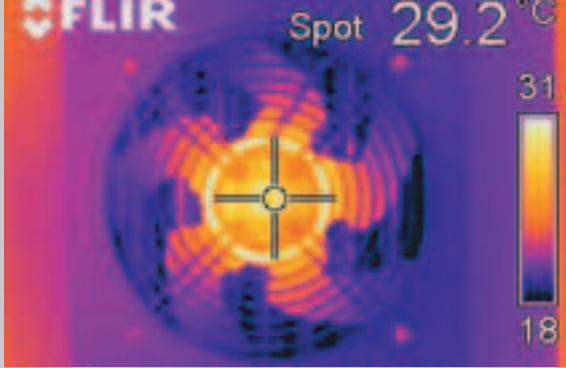
- ▶ Provide a turnkey operation from initial concept discussions through to complete installation and handover.
- ▶ Offer an engineering solution that will satisfy current and anticipated heat load and space requirements.
- ▶ Utilise a packaged plant system that takes advantage of the benefits offered by off-site prefabrication:
 - ▶ Reduced installation time on site.
 - ▶ Consistent quality through the use of specialist skilled labour.
- ▶ Full design and installation of plant, distribution pipework and terminal cooling unit.
- ▶ Satisfy resilience requirements up to an N+N standard as required.

Modular Design

The package plant modules (dimensions available upon request) are to suit capacities of 150kW, 260kW and 360kW (for larger duties use combined modules) with each self contained package containing:

- ▶ An air cooled chiller
- ▶ Operation and standby compressors
- ▶ Evaporative heat exchanger
- ▶ Carbon dioxide receiver vessel
- ▶ Dual pumps, operation and standby

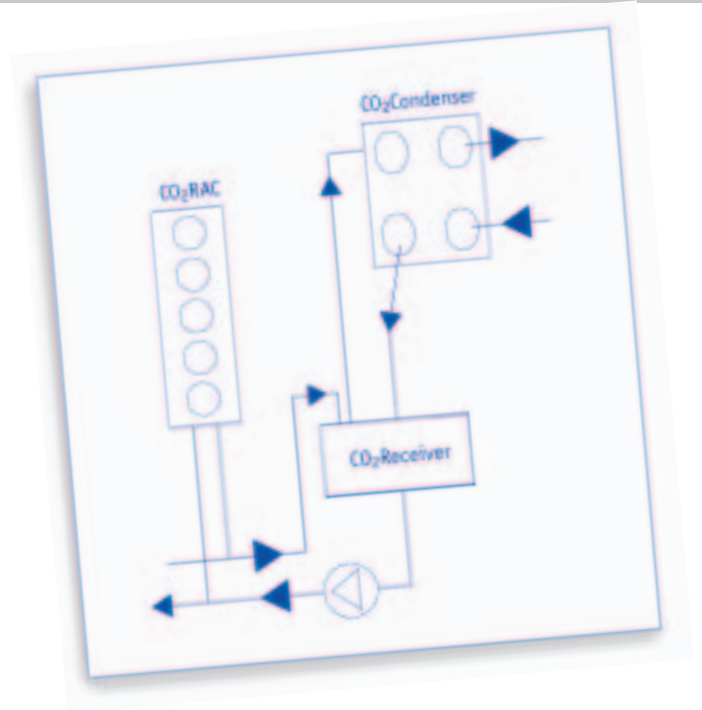




CO₂RAC



The design philosophy of the CO₂RAC is to absorb all of the heat load locally, as rejected by the bladeservers. The CO₂RAC has variable speed fans which are commissioned to match the server airflows to ensure complete 'CO₂RAC-server' compatibility. The CO₂RAC exhaust air into the aisle is at room ambient air temperature.



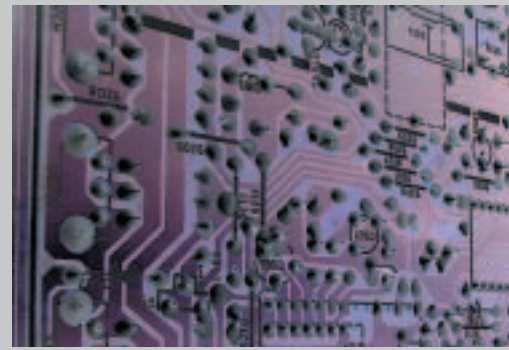
Features & Benefits

- ▶ 18kW cooling: 600mm wide x 42U high
- ▶ 14°C CO₂ flow temperature
- ▶ Universal design: suits all cabinets
- ▶ Hinged design: access to blade servers
- ▶ Fused power supply: hot-swap fans
- ▶ Variable speed fans: balanced airflow
- ▶ Nominal 500 x 250 x 1800mm

System Safety

A high quality installation is essential as the carbon dioxide must maintain an operating pressure of 50Bar(A) to have a flow temperature of 14C. A gas detection system is used to ensure the level is limited to 3% in the space. In case of leaks, isolation valves and gas extraction (as with fire suppressant system) is used. The threshold limiting value (TLV) for carbon dioxide is 5000ppm (0.5%) whereas the TLV for R134a is 1000ppm (0.1%).

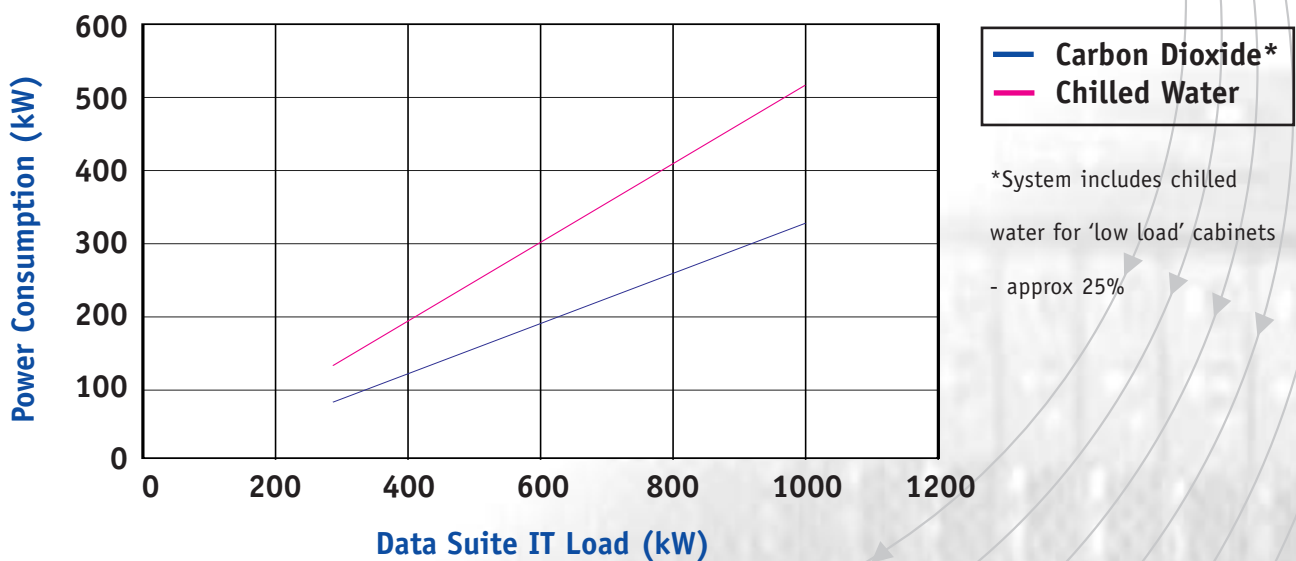




Complete System

Low Energy

A comparison between old generation data suite cooling solutions and one employing carbon dioxide as a secondary refrigerant has been conducted and the following graph plots the results:



Hot and Cold Aisle

The CO₂RAC, absorbing the complete heat gain ensures that the room ambient air temperature is maintained. The space and layout design of the data suite is simplified for the designer and a 'hot aisle' 'cold aisle' philosophy is no longer necessary.

New Build or Upgrade

The system can provide an extremely energy efficient solution, employing thermosyphon chillers, on major new build data warehouses requiring numerous megawatts of cooling. Smaller installations will benefit from the modular design.

Maintenance, Servicing, Equipment Monitoring

A full maintenance and servicing contract is available through Trox Design Bureau to ensure that the system continues to operate effectively in this business critical environment. Support is available on a term contract and emergency call-out basis to provide 24-7 support. Remote monitoring of plant and equipment is available through a web-based system.

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Design Bureau

With its global network Trox provides a local presence around the world:

Abu Dhabi	Denmark	Iran	Norway	Spain
Argentina	Dubai	Ireland	Oman	Sweden
Australia	Egypt	Israel	Pakistan	Switzerland
Austria	Finland	Italy	Philippines	Taiwan
Belgium	France	Jordan	Poland	Thailand
Bosnia-Herzegovina	Germany	Korea	Portugal	Turkey
Brazil	Great Britain	Kuwait	Romania	Ukraine
Bulgaria	Greece	Latvia	Russia	Uruguay
Chile	Hong Kong	Lebanon	Saudi Arabia	USA
China	Hungary	Lithuania	Serbia & Montenegro	Vietnam
Croatia	Iceland	Malaysia	Slovak Rep.	Zimbabwe
Cyprus	India	Netherlands	Slovenia	
Czech republic	Indonesia	New Zealand	South Africa	