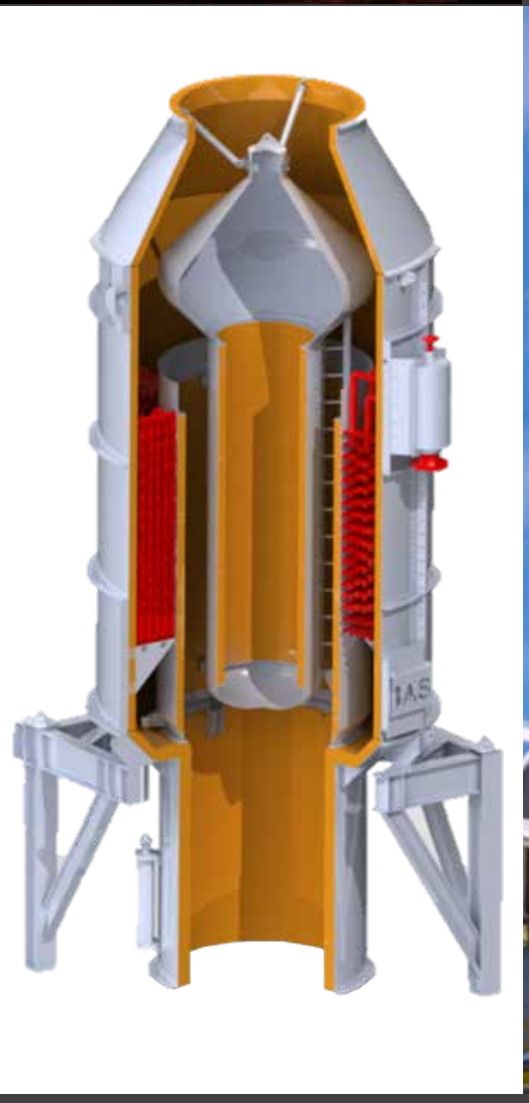
CiBAS



CiTECH

The CiBAS is an innovative and unique WHRU designed by CiTECH, specifically aimed at saving weight and space. With over 70 units in operation, it is an ideal environmentally friendly solution for gas turbine heat recovery, in the upstream and downstream oil, gas and process industries.

A MEMBER OF MUHIBBAH ENGINEERING

CiTECH's commitment to the oil and gas industry over the past 8 decades has resulted in the design and delivery of over 220 specialised gas turbine heat recovery systems.

All CiBAS Waste Heat Recovery Units (WHRUs) are designed specifically to save weight and space, whilst maximising thermal efficiency.

Through the innovation of the designers, aligned with the unique technology of CiBAS, CiTECH are leading the drive for further advances in heat recovery applications to meet a continually expanding range of project requirements. The generic design of the CiBAS allows use across a wide range of gas turbines with exhaust flows between 30 kg/s and 130 kg/s, typically 4MWe to 60MWe.

1938	METEN
1992	SCHACK
1994	ALSTOM
2006	CiTECH
2012	CiTECH MUHIBBAH ENGINEERING (M) BHD

CiTECH are a member of the Muhibbah Engineering Group of Companies.

Established in Malaysia in 1972 and listed on the Main Board of Bursa Malaysia in 1994, today Muhibbah have offices in 10 countries and are engaged in operations spanning 5 continents employing 1,500 personnel.

With offices in Malaysia and the UK, CiTECH perform all manufacturing, assembly and testing in our own extensive in-house facilities.

Muhibbah Group Fabrication Facilities

The most compact, lightweight and cost effective way of recovering heat from your gas turbine exhaust.

The CiBAS (Concentric, Integral By-Pass and Silencing) WHRU combines the helical coil heat exchanger, exhaust gas control (Damper) valve & silencer into a single module which is delivered complete, cold commissioned & ready for installation in just one day.

Why make it complicated?
CiBAS Technology is specifically designed to save weight, space and increase thermal efficiency.

CiBAS's simple design allows it to be utilized in:

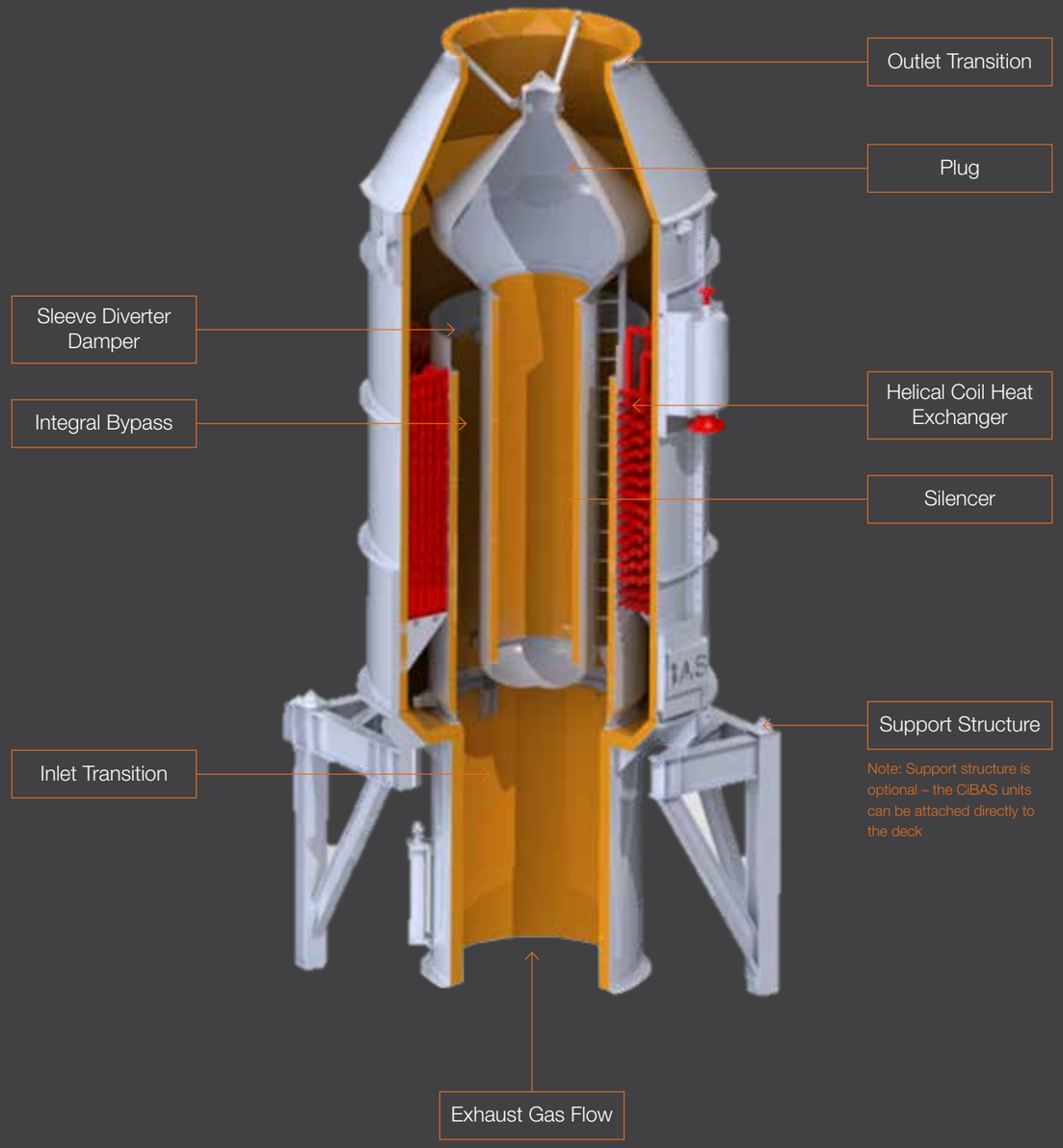
- New Developments
- Upgrades
- Retrofits
- Modifications

For retrofits and upgrades, to minimise time and costs, and to accommodate the clients offshore crane limits, the CiBAS units can be shipped and lifted in modular sections. Due to the inherent simplicity of its design, CiBAS ensures rapid installation, hook-up and deployment.

With the introduction of our patented and unique CiBAS Technology, we have incorporated the benefits of a high efficiency concentric helical heat exchanger into a cylindrical casing, developed from years of Fired Heater experience. Together with a wealth of knowledge of the offshore industry, we have created a concept aimed at providing leading edge innovation.

The CiBAS (Concentric, Integral By-Pass and Silencing)

The unique innovation of CIBAS is combining the separate modules of traditional waste heat recovery units into a single compact pre-assembled package.



Note: Support structure is optional – the CiBAS units can be attached directly to the deck

The unique advantages of CiBAS

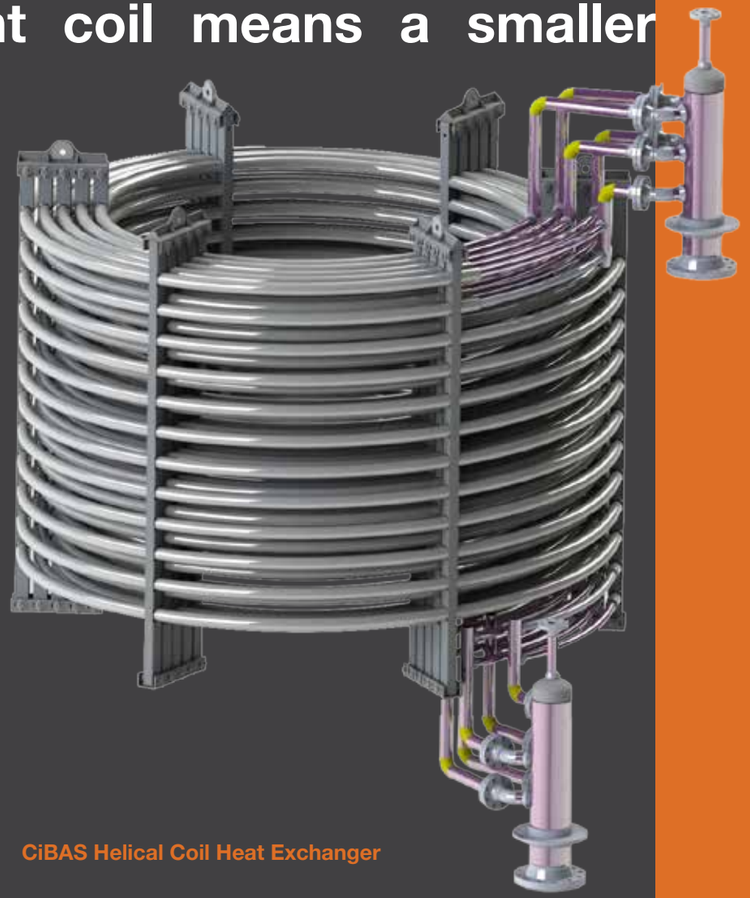
- Low weight & low centre of gravity
- Up to 50% smaller footprint
- Single moving part – high reliability, low maintenance
- Integral high efficiency heat exchanger
- Requires minimal support steel work
- Integral silencer
- Integral fail-to-safe bypass sleeve
- Each unit is designed for individual customer needs
- Linear gas flow through the unit confirmed by extensive CFD modelling
- Suitable for new builds and retrofits
- Low wind resistance
- Proven technology (over 70 CiBAS Units installed)
- Single lift installation
- Atex compliant, cold case design (outer case <65°C)
- Cold commissioning at factory
- Damper sealing efficiency remains consistent throughout unit life
- Current CiBAS range covers exhaust gas flow up to 130 Kg/s
- Patented technology

Thermal efficiency of the helical heat exchanger is superior to conventional tube bundles, which employ straight tubes to recover the energy.

Unlike other units, the entire coil is exposed to the gas turbine exhaust flow thus providing a greater surface area to recover the heat.

Studies have shown the significantly higher thermal efficiency of helical coils, due to the turbulence created within them. A more efficient coil means a smaller and lighter coil.

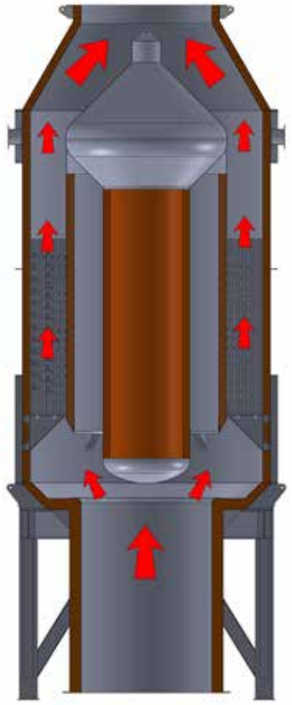
Turbulent flow within a helical heat exchanger



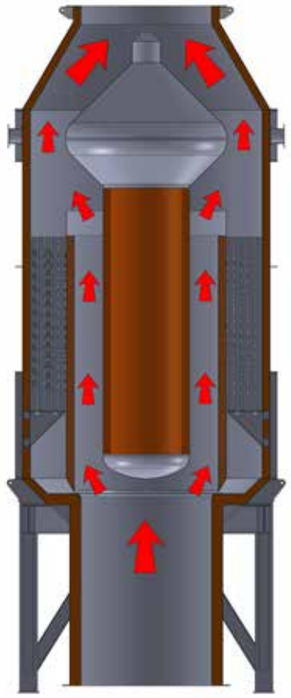
CiBAS Helical Coil Heat Exchanger

CiBAS is unique in having a single moving part, leading to increased reliability and reduced maintenance.

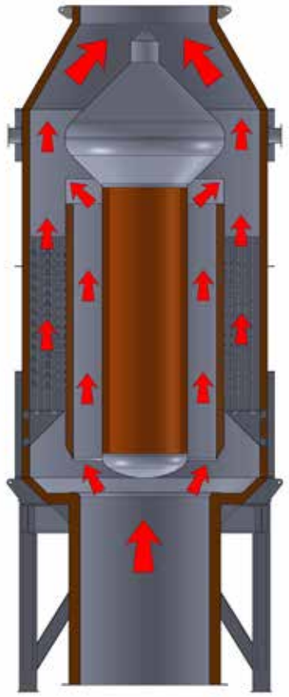
Full Duty
fig.1



Full Bypass
fig.2



Intermediate
fig.3



The single moving part within the CiBAS unit, is the vertically modulating sleeve damper.

When the sleeve is in its uppermost position (fig 1), a seal is made with the conical underside of the silencer plug. Gas turbine flow is directed over the high efficiency helical coil. The unit is in full duty mode.

With the sleeve lowered (fig. 2) an effective seal is then made between its lowermost edge and the lower casing module. The heat exchanger is not exposed to gas turbine exhaust gas. The unit is now in full bypass mode.

In reality, many CiBAS units currently in service modulate between these 2 positions, with the sleeve positioned somewhere between (fig 3). To meet the client's thermal duty demands, some flue gas is allowed to flow over the coil – thus recovering heat, whilst the remainder is allowed to bypass.

Unlike conventional types of damper arrangements that utilise louvre dampers, the sealing efficiency of CiBAS does not deteriorate in service, and is crucially, maintenance free.

Although, under loss of actuation pressure, the sleeve will fail-to-safe into bypass under its own weight, an accumulator is included as standard just to cover every eventuality.

The patented design of CiBAS eliminates the need for a separate silencer – all noise reduction is performed within the unit.

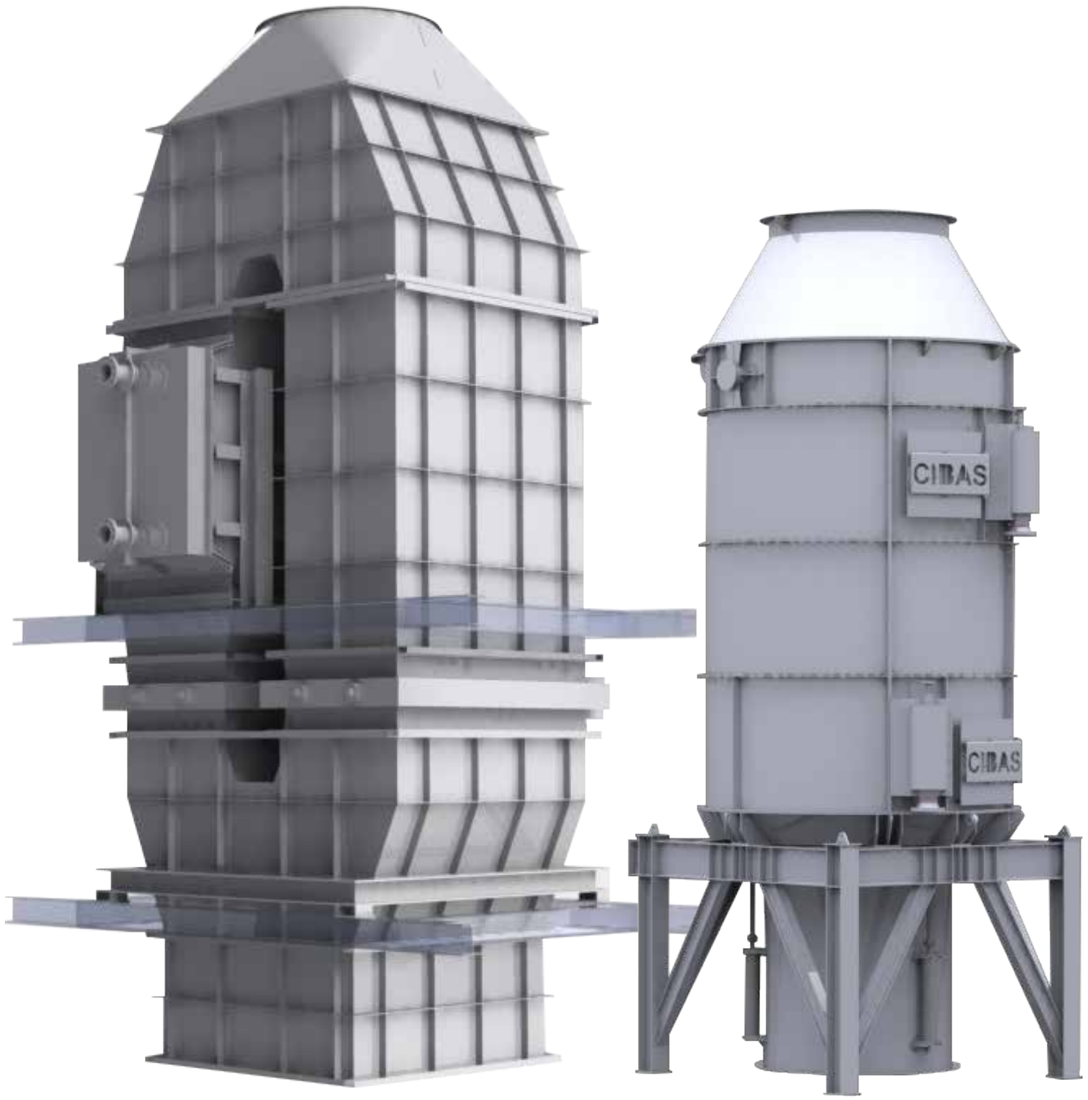
Designed on the principles of a sleeve valve, the single moving part of CiBAS is the cylindrical control sleeve. Unlike the louvre dampers found on conventional recovery units, the turbine flow is directed over the sleeve in a linear manner thus avoiding the stresses and forces that older designs are subjected to. Reliability and longevity are increased whilst maintenance is decreased.

CiBAS lining and insulation system

CiBAS units are cold cased designs with internal insulation.

- Standard outer casings are 6mm carbon steel painted in accordance with client's specification. Other casing materials can be used to meet client's requirements.
- To preserve the internal face of the casings, a barrier of moisture and acid resistant coating is applied.
- High temperature insulation wools are used for sound attenuation and thermal insulation.
- The insulation is retained by stainless steel liner plates which in turn are secured to the casing by sprigs.
- Direction of gas flow is taken into account with the design and arrangement of the lining system.
- Both solid and perforated plates are used throughout the unit.

CiBAS offers significant weight and space savings over conventional equipment.



- Both waste heat units are designed to recover 23 MW thermal duty from a GE LM2500+ gas turbine.
- CiBAS weight is 21 tonne lighter per unit
- CiBAS support structure is 33 tonne lighter per unit
- Centre of gravity is 4m lower with CiBAS
- CiBAS footprint is 20% smaller
- Height is reduced by 5m

Over 50 tonne weight saving per unit

CiBAS Compared

The savings in weight and space are demonstrated dramatically in this comparison.

CiBAS: 49 tonne. Support structure: 4 tonne

Traditional WHRU: 70 tonne. Support structure: 100 tonne (3 units)

Each of the Waste Heat Recovery Units shown in these photographs are recovering 23MW from GE LM2500+ gas turbines. However, the CIBAS unit shown above, weighs 49 tonne, with an additional 4 tonne required to support it. The conventional units shown below, each weigh 70 tonne, but need a considerable further 33 tonne to support each one.

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Accreditations

MS ISO/IEC 17021:2011
QS 02032013 CB 13

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