

Innovative Solutions in Waste Heat Recovery



Why use CiBAS (Concentric integral Bypass & Silencer) for Waste Heat Recovery

- CiBAS weighs up to 30% less against traditional WHRU technology
- Footprint of the CiBAS is up to 50% less (Integration of heat exchanger & exhaust)
- Separate Silencer not required as it's incorporated into the design (<85db)
- Gas Turbine Range of up to 58MW
- ATEX certified with "Cold Case" design (Outer Case temperature <65 °C)
- Integral fail-safe bypass sleeve
- Very low maintenance costs due to simple design. All routine servicing is undertaken during Gas Turbine shut down periods
- CiBAS arrives complete, factory tested & fully assembled for mechanical installation in one day or the option of modular sections
- Simple design with just a single moving/adjustable damper provides much greater reliability and totally consistent sealing integrity throughout the life of the system
- Computational Fluid Dynamic (CFD) studies highlight optimum gas flow through the heat exchanger also reducing resonance
- All CiTECH Waste Heat Recovery Units are designed specifically to satisfy each customers individual process requirement
- We install to Offshore Oil and Gas platforms requiring additional process/thermal resource. We also supply the FPSO Vessel and Onshore Process markets
- 62 CiBAS units have been sold to date & 183 Traditional Waste Heat Recovery Units, proven in the field

For further information visit us at www.citech.co.uk, e-mail sales@citech.co.uk or Telephone: +44 (0) 1482 719 746

Innovative solutions in waste-heat recovery

Obtaining greater energy from a given resource is a prime concern at **CiTECH**. Wherever a gas turbine is installed, there is always the option of increasing the efficiency substantially by capturing the heat expelled from the turbine. This low-cost heat energy can be used for many process and heating applications.

CiTECH Energy Recovery Systems UK, based in East Yorkshire, UK, is a wholly owned subsidiary of Tanjung Offshore Berhad Group, Malaysia. The Concentric Integral Bypass & Silencer (CiBAS) waste heat recovery unit is CiTECH's unique patented system for recovering waste exhaust gas produced by a gas turbine, thus increasing its efficiency substantially.

CiTECH has incorporated the benefits of concentric coil technology derived from years of fired-heater experience with a wealth of knowledge to provide waste-heat recovery to the offshore industry. The company strives to develop cutting-edge technology and feature-laden benefits that give tangible returns. CiTECH has supplied 62 CiBAS systems and 183 traditional waste heat recovery systems to companies such as BP, Chevron, Lukoil, Maersk, ONGC, Reliance, Shell and Total.

Improved space and lower weight

Offshore platforms are extremely confined areas and the need to reduce weight and save space are pressing issues along with high associated costs. CiBAS addresses these concerns by offering the lightest and smallest system, which also provides the performance and reliability required.

The unit offers considerable benefits at the FEED stage because the equipment can be integrated into the design early in the project development. Retrofitting is another area where CiBAS is suitable because it is an easy replacement option for expired traditional systems.



CiBAS units installed at Chevron's Tahiti field in the Gulf of Mexico.

CiBAS in action

The CiBAS unit is installed at the gas turbine exhaust outlet and acts as the process recovery unit and the sound attenuating system, thereby eliminating the need for an additional exhaust and silencer.

The captured energy can be used for a variety of heat processes such as heating oil, water or water/glycol for processing oil/gas and gas regeneration.

For cold climates, CiTECH applies the CiBAS process for platform ice clearance and accommodation heating, which allows for continuous use in Arctic conditions. Because of the unique way that the CiBAS operates – involving one primary moving part – performance and reliability is greatly improved, offering the cheapest life cycle cost of any waste heat recovery system. A gas turbine that has a typical energy-efficiency rating of 33% can increase to around 70% efficiency when waste heat is recovered by CiBAS.

“ A gas turbine that has a typical thermal energy-efficiency rating of 33% can increase to around 70% efficiency when waste heat is recovered by CiBAS. ”

Built to industry standards

CiTECH's new 55,000ft² factory is located near the Humber River and is where the company designs, produces, assembles and tests its bespoke range of waste heat recovery systems. Once delivered to the customer's site, the units can be installed with minimal effort. The unit can be bolted in (flange to flange) within one day.

CiTECH manufactures its units to the quality standards demanded by the oil and gas sector, including ISO 9001-2008, ASME U, NORSOK. The company is Lloyds accredited and is a member of FPAL and Achilles. ■

Further information

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Snøhvit, Hammerfest LNG Plant

Project: Snøhvit

Operator: Statoil Hydro

Model Class: Traditional WHRU (42Mw)

Quantity: 5

Country: Norway

Heating Fluid: Statoil 30HFT

CiTECH Energy Recovery Systems UK supplied five Gas Turbine Heat Recovery Units for Statoil's Snøhvit project in Hammerfest on the north coast of Norway.

These units were loaded onto a heavy transport barge, which in turn was loaded onto a transport ship. The CiTech WHRU were installed to recovery energy from the LM6000 gas turbines operating on the plant.



TOTAL SUPPLIER TO THE OFFSHORE INDUSTRY

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Ormen Lange

Project: Ormen Lange
Operator: Norsk Hydro Model
Class: Fired Heater/Hot Oil Heater
Quantity: 2
Country: Norway
Location: Onshore

Completion of two C45 Fired Heaters and transportation to site at the Norsk Hydro's Ormen Lange project in Norway.

Two packages were deployed quarter 3 2006 with a destination of Ormen Lange. This process required the closing of roads by police to move the huge cargo, as shown in the images above. The units were individually placed on a 150 wheel platform, which was then driven via remote control between the fabrication plant and dock for loading and exportation.



TOTAL SUPPLIER TO THE OFFSHORE INDUSTRY

Sleipner Platform

Project: Sleipner
Operator: Statoil
Model Class: CiBAS C100
Quantity: 1
Country: Norway
Location: Offshore

CiTECH is providing Statoil with a CiBAS unit to replace one of Sleipner's C20 recovery units. The unit has been designed to Statoil's specific requirements.

Sleipner unit during fabrication at CiTECH's Hull fabrication plant.



TOTAL SUPPLIER TO THE OFFSHORE INDUSTRY

CiTech Waste Energy Recovery

More than 25-years Experience in Norway

CiBAS

Date	Contract	Type/Model	Client	Operator	Project	Country	Heating Fluid	Quantity	Gas Turbine	Duty	Total Duty
2003	C769	C70	ABB Offshore System	Conoco Phillips	Ekofisk2/4K	Norway	Water/Glycol	2	LM2500	2,500	5,000
2005	C779	C100	Dresser Rand/Vetco	Statoil	Sleipner	Norway	Water/Glycol	1	LM2500	23,000	23,000
2007	C789	C70	SHI	APL	NEXUS 1	Norway	Water/Glycol	2	Titan 130	15,000	30,000
2007	C791	C45	SBM	SBM	YME	Norway	Water/Glycol	2	Titan 130	16,000	32,000
2008	C797	C70	SHI	APL	NEXUS 2	Norway	Water/glycol	2	Titan 130	15,000	30,000

Traditional

Date	Contract	Type/Model	Client	Operator	Project	Country	Heating Fluid	Quantity	Gas Turbine	Duty	Total Duty
1983		TWHRU	Statoil	Statoil	Gullfakt A	Norway	Water /Glycol	3	LM 2500	21000	63000
1986		TWHRU	Statoil	Statoil	Gullfaks A	Norway	Water/Glycol	3	LM 2500	21000	63000
1990		TWHRU	Aker Engineering	Statoil	Sleipner A	Norway	Water/Glycol	3	LM 2500	18600	55800
1990		TWHRU	Kværner Engineering	Shell	Draugen	Norway	Heat Transfer Oil	3	GT35	11000	33000
1992		TWHRU	Cooper Energy	Conoco	Heidrun	Norway	Water/Glycol	3	RB 211	26000	78000
1992		TWHRU	Dresser Rand	Norsk Hydro	Troll	Norway	Water/Glycol	4	LM2500	24400	97600
1992	C677	TWHRU Int. Bypass	Dresser Rand	Statoil	Statfjord C	Norway	Water/Glycol	1	LM2500	23140	23140
1994		TWHRU	Kværner Engineering	Statoil	Sleipner West	Norway	Water/Glycol	2	LM2500	18600	37200
1995		TWHRU	Dresser Rand	Phillips	Ekofisk II	Norway	Heat Transfer Oil	2	LM2500	14400	28800
1995		TWHRU	Kværner Energy	Statoil	Norne FPSO	Norway	Water/Glycol	2	LM2500	18600	37200
1996		TWHRU	Dresser Rand	Statoil	Asgard A	Norway	Water/glycol	2	LM 6000	30000	60000
1996		TWHRU	Statoil	Statoil	Veslefrikk	Norway	Steam	1	LM 2500	1400	1400
1997		TWHRU	Dresser Rand	Statoil	Asgard B	Norway	Heat Transfer Oil	5	LM 2500+	21000	105000
1997		TWHRU	Dresser Rand	Statoil	Statfjord C	Norway	Water/Glycol	1	LM 2500+	19000	19000
1997	C736	TWHRU Int. Bypass	Kværner Energy	Esso Exploration	Jotun FPSO	Norway	Water/Glycol	2	LM 2500	23100	46200
1999		TWHRU	Kværner Oil & Gas/Aker Maritime	Saga	Snorre B	Norway	Steam	1	LM2500+	60000	60000
1999		TWHRU	Aker Offshore Partner	Phillips	Eldfisk	Norway	Steam	1	LM2500/LM1600	48000	48000
1999		TWHRU	Aker Verdalen	Norsk Hydro	Oseberg Gass	Norway	Steam	1	LM2500+	60000	60000
2002	C759	TWHRU Int. Bypass	Kværner Aker	Statoil	Kristin	Norway	Water/Glycol	1	LM2500+	25000	25000
2002	C764	TWHRU	Linde	Statoil	Hammerfest	Norway	Staoil 30 HFT	5	LM6000	42000	210000