August 2008 – TANJUNG emerged as major shareholder after acquired 100% of CiTECH stake. Renamed as Tanjung CiTECH Ltd. (operating company CiTECH Energy recovery Systems Ltd.)
CiBAS design for waste heat recovery from gas turbine exhaust.

“Concentric Internal Bypass And Silencer”
CiBAS Range

Mass Flow kg/sec

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<th>14 MW</th>
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CiBAS General Presentation
CiBAS – Isometric view

Top Case

Coil / Tube Bundle

Sleeve

Plug

Lower Case

Exhaust gas Inlet

Coil Case

Support Structure
• Fig 1 shows the CiBAS unit in full operational mode.

Sliding sleeve moves up and seals against the plug to allow full flow of the exhaust gas to the coil.

• Fig 2 shows the CiBAS unit in the bypass mode.

Sliding sleeve moves down and seals against the lower casing seal plate to allow full flow of the exhaust gas straight through the package.
Sliding Sleeve - Actuation

There are 3 operating pushrods to sleeve to ram arm mounting plate.

Sleeve to ram arm mounting plate.

Ram arm.

Metallic Brush seal gives maintenance free service for the life of the unit.

Thermal break between the actuator shaft and the slave shaft to protect the hydraulic/pneumatic cylinder..

Lower casing

Actuator & Brackets.

CiBAS General Presentation
Actuator Shaft Sealing

- After experimenting with many low cost labyrinth sealing arrangements we have utilised a maintenance free metallic brush seal similar to that seen on Turbine shaft applications.

- Maintenance free but at the penalty of a slightly higher cost.
Coil, Hangers & Manifold

The coil Helical is manufactured with finned tube and can be withdrawn or inserted individually to permit the bundle to be loaded out as sub 10 Tonne strings for assembly on board platform.

Standard external mounted headers to avoid thermal shock, connected by coil risers & down-comers.
Coil support brackets removable individually to allow individual coil string removal in the unlikely even of a tube failure.
Lower casing supports the CiBAS unit and guides the exhaust gases to the coil from the turbine outlet.

Revised lower casing with more substantial offshore support. Casing is structurally designed to cater for all forces during operation transportation and during tow out.
Coil Assembly to Lower Case

Assembly of the coil into the lower casing

Standard manifold arrangement
Sliding Sleeve diverter valve insulated on the inside to give thermal and noise suppression. No protruding parts on the outside surface to interfere with the operation of the sleeve against the coil.

Anchor points at the base of the sleeve allow simple attachment of the actuators via a slave shaft to the sleeve by clevis pins. 3 equally spaced actuators offer redundancy of operation to facilitate maintenance.

Maintenance free guide cups guide the sleeve on the plug support assembly. No bearing weight on these guides as the weight of the sleeve is supported by the actuators.

Sleeve is a lightweight construction of rolled Corten/TP409 or stainless steel, strengthened by stiffening rings of the same material.
Central Plug Assembly

• Plug has 2 functions
  • To guide the sleeve during modulation
  • To attenuate sound when the CiBAS is in bypass mode.

• Constructed of stainless steel, perforated plate in lower section and insulated for sound attenuation.

• Access ladders incorporated into the Sleeve guide rails to facilitate visual coil inspection during periodic maintenance inspections.

CiBAS General Presentation
Coil casing is then fitted over the coil and secured to the lower casing.

Followed by the sleeve and plug.
Top Casing & Plug Retaining Bracket

The top casing is then secured to the coil casing to complete the base package assembly.
Cut-Away view of assembly

Outer cold casing.

Sliding sleeve diverter valve seals against plug top to give full exhaust flow to the coil.

Headers inlet and outlet arranged to exit at the package base unit area.

Inner Plug supports guide the sliding sleeve diverter valve and silences the exhaust noise during bypass.

Coil is designed to give correct process and exhaust gas pressure drops and is optimised for each project.

Hydraulic or pneumatic actuators mounted outside the casing away from any heat exposure.
• Low Maintenance high availability
• Cold commissioned before shipment
• Rapid Installation
• Small footprint 50% less than traditional designs
• Low weight 30% less than traditional designs
Assembly

- Before the CiBAS is accepted by the client it is fully assembled, cold commissioned and ready for transportation as a single lift item to any location in the world.

- Factory acceptance tests include a hydro test and a functional test of the Modulating sleeve.

- At extra cost we are able to demonstrate CiBAS operation under hot conditions by use of a simple combustor. However standard FAT’s are under ambient conditions.
Installation

• Once transported, the units are lifted from the transport ship and can be installed directly onto the platform.

• The CiBAS units shown right were for Chevron gulf of Mexico – Tahiti platform. All three units including the inlet and outlet ducting were installed in 2 days.

• Savings to the platform were
  • 125 tonnes in topside weight
  • A cantilevered deck less than 50% of the size of the previously used traditional solution.
  • $millions in installation time and cost
  • $millions in life cycle cost and potential down time savings.
Questions & Clarifications