

GAS TURBINE EQUIPMENT

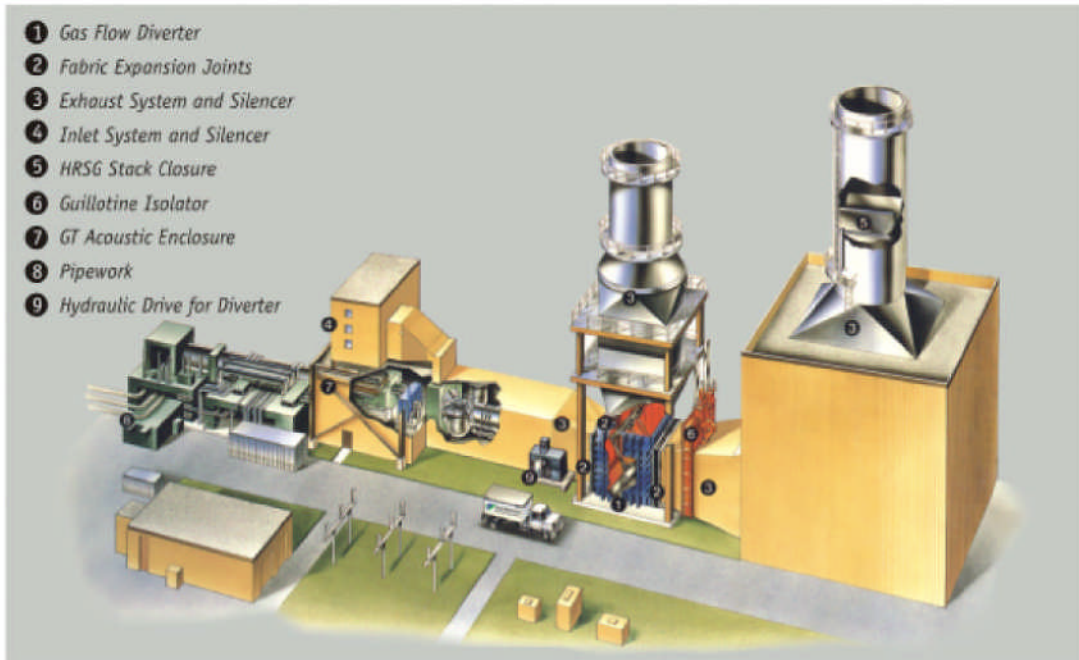


BACHMANN
INDUSTRIES INDIA LIMITED



*Gas Turbine Exhaust By-pass
systems at Salalah, Oman*

GT EXHAUST BY-PASS SYSTEMS



One-stop solution from GT intake to Exhaust By-Pass

A complete range of product equipment, backed by strong in-house engineering enables turnkey supply of complete intake and exhaust systems for all types of Gas Turbines.

By-Pass System references include:

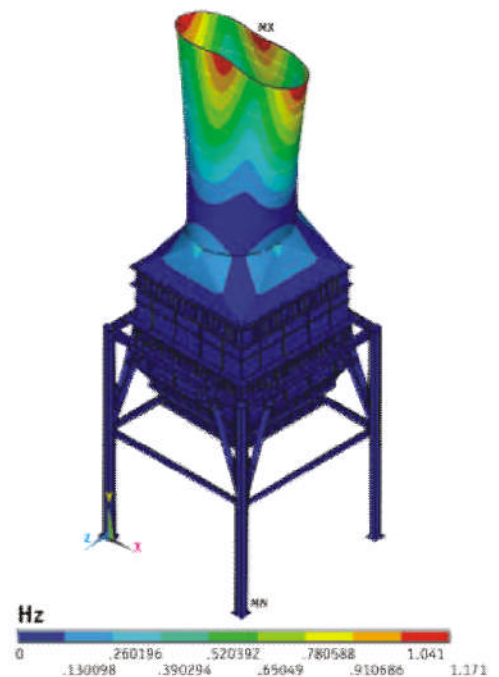
- | | |
|------|--|
| 1996 | NTPC Dadri
4 off, V94.2 Siemens |
| 1998 | Kondapalli,, Hanjung
2 off, Frame-9E GE |
| 1999 | NAOC Nigeria, GE
4 off, LM-2500 |
| 2000 | Hazira, Alstom Power
2 off, GT KABC2 |
| 2002 | Salalah, Oman, L&T
6 off, GE Frame-6 |
| 2003 | Salalah, Oman, L&T
1 off, LM-2500 |
| 2005 | Konaseema, L&T
2 off, V94.2 Siemens |



Exhaust By-pass system at Konadapalli for GE Frame-9E GT



Frame-6 GT Exhaust By-pass systems at Salalah Power Station, Oman



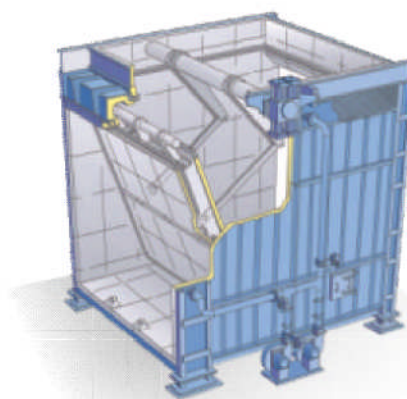
This Finite Element Analysis was conducted for the Siemens V94.2 GT Exhaust By-pass for Konaseema Power Station. In-house modelling of thermal and structural stresses on the system assures optimum selection of materials and section sizes.

GAS FLOW DIVERTERS

Multiple design solutions for the full range



Combining the best features of the original Bachmann, USA and Metroflex, UK; the current diverter designs are state of the art. Both **toggle drive** and **pivot drive** options are available covering the complete range - from the smallest 1000mm sq. opening, to the largest 6400 mm sq. Frame-9FA size. The design can accommodate a variety of aspect ratios, electric or hydraulic drive, circular or conical inlet, and internal or external insulation configurations.

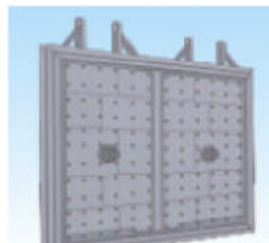


5600mm sq. (GE Frame-9E) Gas Flow Diverter - Toggle Drive, Electric operation

Key features:



The pivot drive **bearing** is a self-aligning, permanently lubricated, patented design utilizing highly machined sintered bronze segments.



The diverter floating **blade**, consisting of a "hot" structural frame sandwiched between two "cold" blade skins, is 100% thermally compensated in all directions.



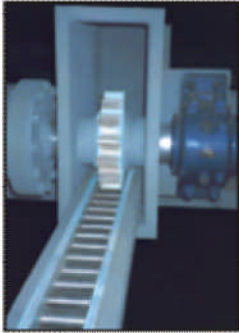
The proprietary **duplex seal** design consists of multiple super-alloy leaf seal segments which are "pressure-assisted" to achieve a positive seal between blade and frame mounted landing bars.



Hydraulic power units are ideal for very fast operation - even of the largest diverter systems. Drive may be either thru hydraulic motors or thru double-acting hydraulic pistons.

GT GUILLOTINE DAMPERS

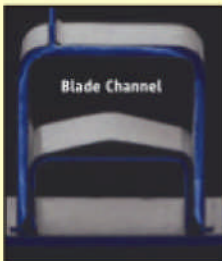
The Bachmann Gas Turbine Guillotine Damper is the preferred choice for high-temperature GT service. Installed downstream of a Gas Flow Diverter, the GT guillotine provides 100% isolation to enable "man-safe" entry.



Self-cleaning **rack & pinion drives** never need lubrication and are highly rugged and reliable. An electric actuator and gearbox gives positive drive to the blade in both directions, without the possibility of stretching or mechanical binding that may occur with chain-drive mechanisms. Either of vertical, side or flat draw orientations are possible.

The fully-insulated bonnet provides a completely enclosed chamber for the seal-air, and assures zero-leakage to the atmosphere under all conditions. The blade stays always "hot" as seal-air is switched off when the blade retracts into the bonnet.

Flex-seat seals - self-cleaning and durable

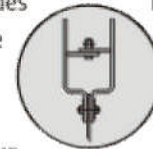


The design provides for a labyrinth path for flue gas thru a two-sided contacting arrangement. Super-alloy seal materials retain their "spring-back" properties at elevated temperatures. A minimum of 99.9% sealing efficiency is guaranteed (100% with seal-air).



A frame 9E GT guillotine under vertical testing at Faridabad works.

The blade is a corrugated construction, fully supported from deflection on all sides by the solid seat. The "C" shaped blade profile channel perimeter is provided with a slotted bolt-hole arrangement which enables full thermal expansion in all four directions without the distortion experienced in conventional solid plate designs.



SILENCERS & DUCTWORK

Turnkey duct system components supply includes silencers, stacks, support structures and ductwork (including square to square and square to round transitions).

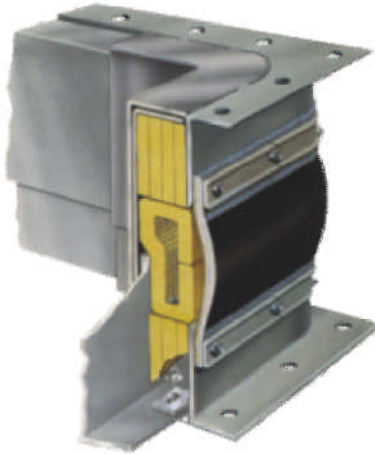
This silencer for Salalah power station in Oman attenuates the GE frame-6 gas turbine exhaust by-pass stack noise level to within 85dbA at 1 metre from the system perimeter



The stack transition is a square to round transition piece, consisting of an internally insulated carbon steel shell. Externally insulated stainless steel constructions are also possible

GAS TURBINE EXPANSION JOINTS

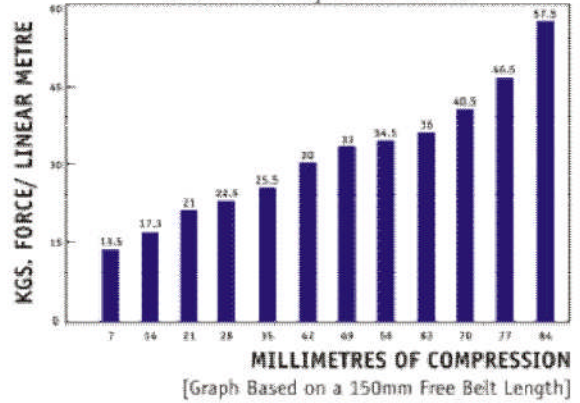
Distinct from conventional expansion joints, the Bachmann GTEJ range incorporates unique design features to combat the thermal extremes faced while operating at upto 700°C exhaust temperatures :



- All welded components are of same material with identical thermal growth coefficients.
- Stainless steel liners are of a bolted construction with slotted holes to allow full thermal differential expansion.
- Hot gas flow path to belt element is prevented by a pinned dome seal arrangement, which "follows" the frames' thermal movement.
- "Channel clamp" fixing system of belts prevents gas leakage.



Spring Force Chart
Gas Turbine Expansion Joints



EJ fabric belt can handle both lateral and axial movements with very low spring force in comparison to metal expansion joints.

AIR-INTAKE FILTERHOUSES

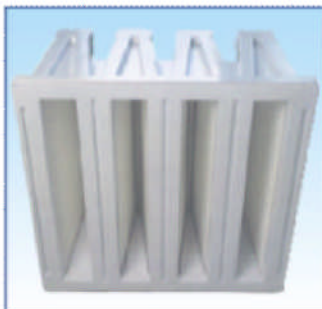


The comprehensive filter product range is capable of meeting all customer requirements, right up to the maximum levels of separation efficiency. Pulse-jet filterhouses comprised of banks of

cartridge filters are "self-cleaned" by means of sequential reverse-flow pulses of compressed air. Cartridges are available to suit all environments, and efficiencies in excess of 99% can be achieved.



Static filterhouses use a combination of pre-filters and high efficiency filters. Pre-filters can remove several hundred kilos of dust from the GT inlet air before the high efficiency filters must be replaced.



State-of-the-Art Manufacturing:



CERTIFICATE



The Certification Body of
TÜV AMERICA, INC.
Danvers, Massachusetts USA

herby certifies that

BACHMANN INDUSTRIES INDIA LIMITED
PLOT NO. 10, SECTOR 6, MATHURA ROAD,
FARIDABAD - 121 006, INDIA.

has implemented a Quality Management System
in accordance with:

ISO 9001:2000

The scope of this Quality Management System includes:

**Design, Manufacturing, Installation & Servicing of
Gas & Liquid Control Equipment & Accessories (including Isolation &
Modulation Control Dampers, Divertors, Gates, Valves &
their Drive System, Expansion Joint, Duct, Stack Support Structures)
Silencers, Air Intake Systems, Flue Gas Conditioning & Heat Exchangers**

Further Clarifications regarding the scope of this certificate and the applicability of
ISO 9001:2000 requirements may be obtained by consulting the organization.

This certificate is valid until: January 31, 2007

Certificate Registration No: 951 04 2536

Issued: March 26, 2004



G. M. J. ...
Director, TÜV America Certification Body
Member of TÜV SÜD Group



Continuously qualified under the ISO 9001 quality system since 1998, experienced personnel operate under well-established design and manufacturing practices at factories located in Faridabad and Chennai.



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