Retrofits / Upgrades of Gas Turbine Exhaust Ducts
Major Drivers of Retrofits / upgrades of Gas Turbine Exhaust Ducts

• Change in Power Plant Operation
  – Due to changes in operating regimes (two shifting etc.) many gas-fired power plants are now facing a significant amount of repetitive maintenance on Gas Turbine Exhaust ducts during their annual outages.
  – Damage mechanisms are often related to the increased number of unit starts and high flue gas velocities in the GT exhaust ducting.
  – Minor defects in the external / internal insulation of exhaust ducts system can rapidly lead to widespread damage (potential for significant loss of plant availability).

• Upgrading duct systems of ageing Power Plants
  – Many of the “older” power stations can be upgraded from a “hot casing” design to a “cold casing” design extending Power Plant Life and reducing maintenance cost.
  – “Noise reduction requirements include the installation of additional Silencer splitters
General Capabilities

• GE Frame Engine Exhausts
  – Frame 3,5,7,9 (Both E,F as H types)

• ALSTOM GT Exhausts
  – GT8, GT10, GT11, GT13, GT24, GT26

• MITSUBISHI GT Exhausts
  – 501, 701 (Both D as F Types)

• Siemens GT Exhausts
  – V64, V94 (Both type 1,2 as well as 3)

• Others
  – LM engine exhausts, Aerodervative Exhausts
Typical Damages (1)

Severe cracking and degradation of original duct sections due to thermal shock
Typical Damages (2)

- Severe cracking
- Silencer have detached during operation
Typical Damages (3)

- Ducting plates have split
- Buckling of plate sections
Typical Damages (4)

Further evidence of damage due to thermal shock
Upgrade Programs

• Analysis & Flow Modelling
  – Supporting Cyclic Power Plant Operation
  – FEA studies
    • to eliminate thermal shock for the silencer supports
    • overall strength calculations of casing and flue gas silencers

• “cold casing design” option
  – utilising only internal insulation.
  – long term internal insulation integrity
  – safer operating regime
  – significantly reduced maintenance down time.
Examples of Analysis & Flow Modelling

Flow Modeling

Stress Calculations
Silencer Support

Stress Calculation Casing

Stress Calculations
Fluegas Silencers
Example of upgraded Duct Design
FABRICATION OF DUCTING

• **State of the Art fabrication facilities**
  – Larger manufactured and Pre Fabricated modules
  – minimizing installation time and Power Plant Downtime
  – Reducing Risk by performing shop Trial Fit’s before installation

• **Transport and site logistics**
  – main driver for extent of “Pre Fabrication”

• **Site works**
  – Experienced and certified ATA supervisors, HSE and project managers
  – Cooperating with experienced local Installation companies
FABRICATION OF NEW FLUE GAS SILENCERS

• **IN-HOUSE engineering**
  - In line with customer specifications
  - Modular Design adaptable to specific requirements

• **IN HOUSE Manufacturing**
  - Dedicated ATA factory in Nunspeet
REDUCING DOWNTIME / OVERHAUL TIME

- In House Engineering to select best technical & operational options
- Advance Project Planning
- Site Logistics Planning
- Modular design of the replacement ducting
- Local Support Companies
- Close cooperation with Site and Site Engineers

Completing the project within the critical path of the hot gas path inspection of the gas turbine
Gas Turbine GE Frame 9E Exhaust Duct Replacement Programme

Case Study in Photographs

Report from a Project in the UK
Site preparation to resemble duct pieces (1)

Lay down area prior to commencement of work with core samples being taken to establish ground condition
Site preparation to presemble duct pieces (2)

Concrete footings are poured and a temporary erection stage is assembled
Site preparation to presemble duct pieces (3)

The temporary erection stage is inspected and approved by the station owners.
Preparation to receive duct pieces

Scaffolding is erected around the stage to allow the pre-fabrication of the modular duct sections
Arrival of prefabricated duct pieces

Prefabricated / modular replacement duct sections are delivered to site
Lifting prefabricated duct pieces

Modular duct section is lifted onto stage for pre-assembly
Pre assembly of duct parts (1)
Pre assembly of duct parts (2)

Replacement duct sections under assembly
Installation of new flue gas silencers

Dedicated lifting equipment is used to assemble silencer sections
Pre assembly of duct parts (3)

Replacement duct sections under assembly
Completion of pre assembly phase

Completed duct sections prior to installation
Removal of old ducting (1)

Original duct sections are removed by “jacking” and “skidding”
Removal of old ducting (2)

Original duct sections after removal are “jacked” higher to enable transport by dedicated bogie to lay down area.
Removal of old ducting (3)

Due to the poor state of the silencers “bracing” is required to facilitate safe removal.
Removal of old ducting (4)

Original duct sections are transported to lay down area in preparation for scrap management process
Installation of new duct pieces (1)

Replacement duct sections are transported from lay down area for installation
Installation of new duct pieces (2)

Replacement duct sections are manoeuvred into position in readiness for final tie-in work.
Scrapping of old duct sections (1)

Original duct sections are scrapped on the lay down area.
Scraping of old duct sections (2)

The scrap duct sections are cut and removed from site for recycling / processing
Construction (Design and Management) Regulations 2007

Improve health and safety in our industry
Have the right people for the right job at the right time to manage the risks on site
Focus on effective planning and managing risk - manage the risk not the paperwork