



STEAM BOILER PLANTS

Providing Specialised Expansion Joint Technology



Introduction

With a worldwide reputation for excellence, **DEKOMTE** manufactures fabric and stainless steel expansion joints for all applications within a thermal power station and offer varying technical standards to suit the technical requirements, maintenance cycles and budgets for each joint.

Boilers and pressure parts subject the ducting to extreme stress and fatigue, with the expansion joint being the focus point and relief.



In many power plants, the failure and replacement of expansion joints is considered routine maintenance, with weld repairs to steel parts and duct cracking becoming common place during outages.

DEKOMTE has more than four decades of experience in designing two-shift, high-cycling expansion joint systems, as OEM equipment and as retrofitted systems. A complete solution, encompassing the whole scope of duct, frame, adjacent insulation and expansion joint, will provide a reliable, maintenance-free solution with a longer lifespan.



Depending on the operating conditions of the site, a **DEKOMTE** solution can offer lifespans of up to 25 years.

DEKOMTE is accredited to RAL GZ 719, the world-class quality standard for fabric expansion joints, ensuring that a detailed and thorough technical approach is maintained in all products offered, and the highest quality is guaranteed in the delivered solutions.



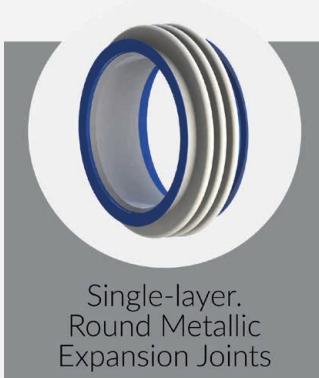
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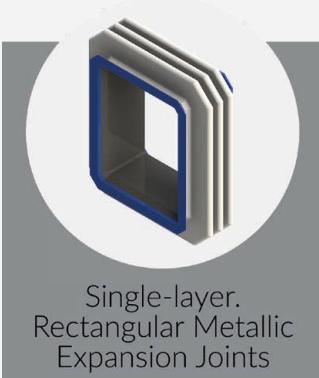
Products



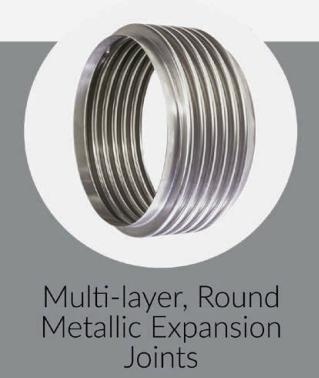
Fabric Expansion Joints



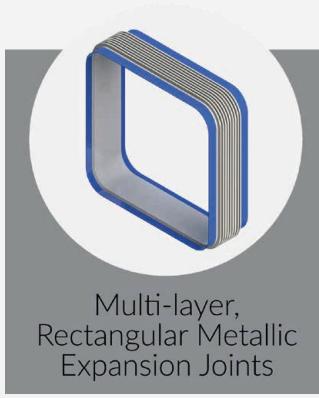
Single-layer, Round Metallic Expansion Joints



Single-layer, Rectangular Metallic Expansion Joints



Multi-layer, Round Metallic Expansion Joints



Multi-layer, Rectangular Metallic Expansion Joints



PTFE Expansion Joints

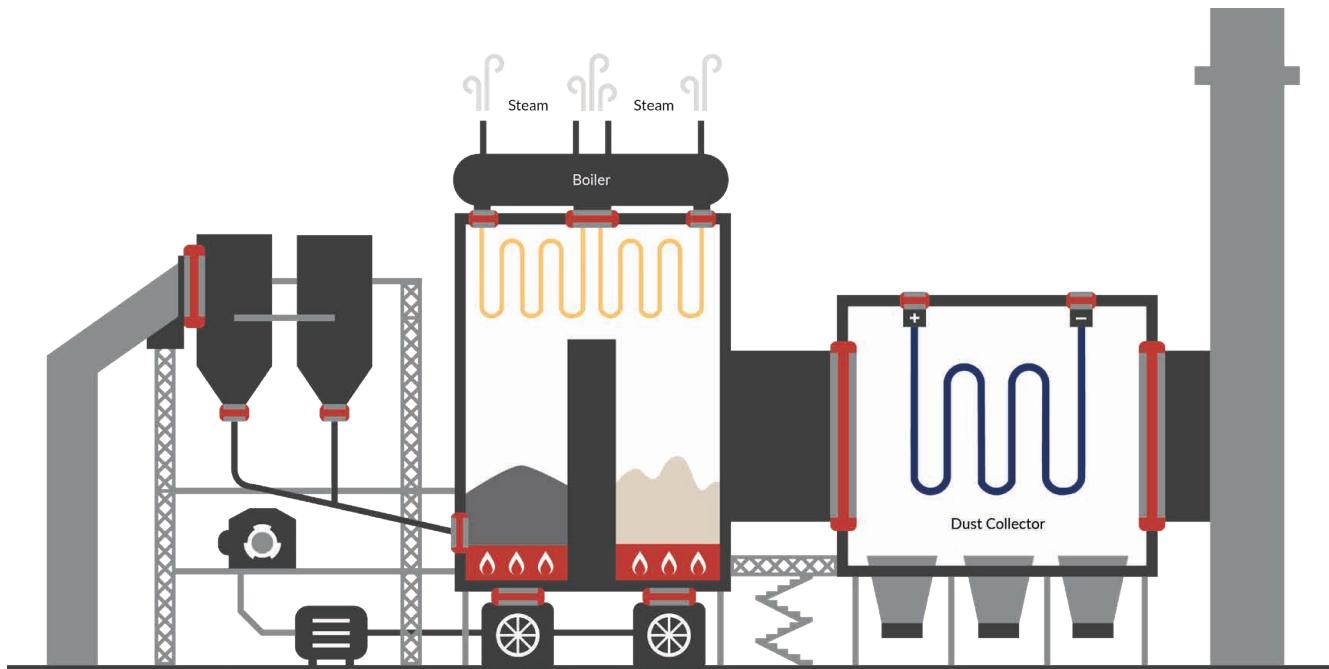


Rubber Expansion Joints



Flexible Hoses

Conventional Oil / Coal-Fired Boilers



Conventional boiler power plants burn predominantly fossil fuels of coal, oil or gas. However, in recent years many plants have been converted to fire using additional biofuels with renewable credentials.

Boiler designs have not significantly changed in 100 years, with the basic thermal physics based on the Rankine cycle. Flue gas treatment and scrubbing systems are the main area of development and have increased usage of expansion joint systems.

Increasing combustion temperatures in supercritical design boilers adds some complexity in achieving reliable expansion joints, particularly as the movements can get much larger.

Expansion joints are incorporated between systems and components to provide low tension thermal expansion compensation. Further areas of utilisation include sound absorption, muffling and vibration damping, fire prevention and adjustment of assembly inaccuracies and varying settling patterns of foundations.



DEKOMTE has designed expansion joints for numerous high technically demanding environments, from extreme temperatures of above 900°C / 1650°F, to below 50°C / 120°F. Large movements and tight installation areas pose interesting challenges, which we handle every day.

FKM and EPDM joints are essential in low temperature ducting, where dew point may occur. The sealing of the duct with a stable and durable rubber joint is necessary, particularly in FGD systems where acid dew point may be prevalent. Moulded corners and formed joints give reliable operation with minimal fatigue usage and longer life with no creasing or folding.



DEKOMTE expansion joints can be used in the following locations of a plant:

Fabric Expansion Joint Applications:

- Ash hopper
- BOFA - Boost Over-Fire Air Ducts
- Boiler penetrations and duct connections
- ESP - Electro-Static Precipitation
- FGD - Flue Gas Desulphurisation
- Main boiler ducting
- SCR - Selective Catalytic Reduction
- Ventilation ducts

Metallic Expansion Joint Applications:

- Air supply / plant air
- Flue gas
- High pressure pipework
- Oil connections
- Steam piping and penetrations

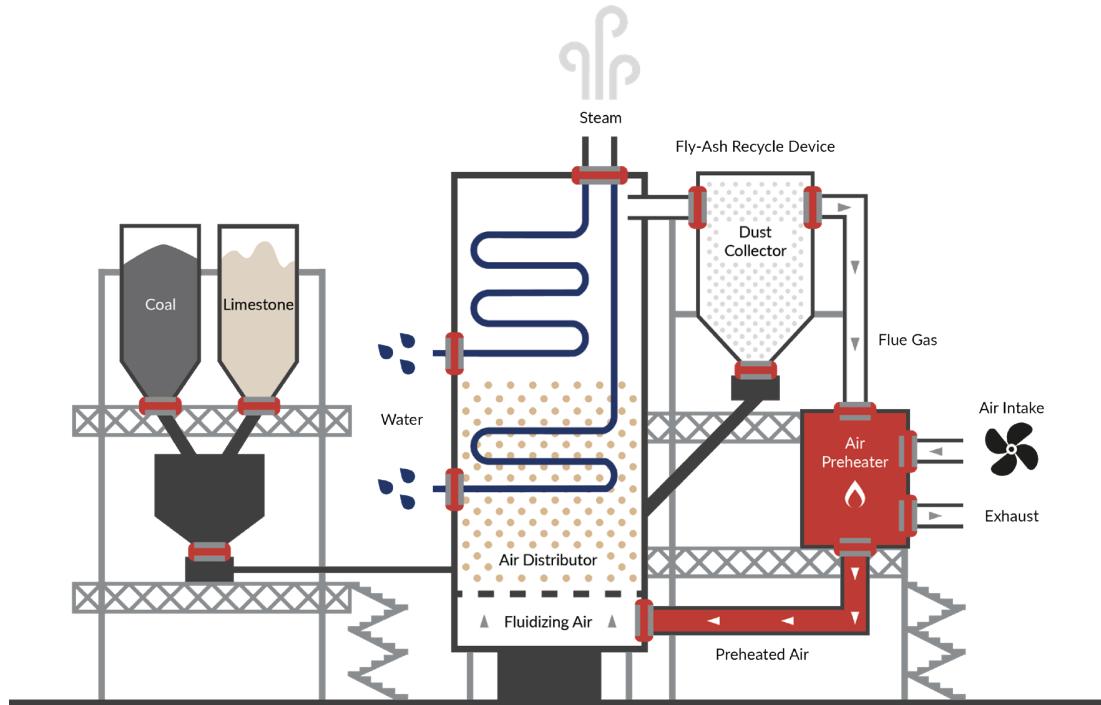
DEKOMTE offers varying technical solutions to suit the technical requirements, maintenance cycles and budgets for each location of the joints.



The large-scale systems necessary for desulphurisation of flue gases have created highly demanding technical and environmental requirements for expansion joints. The large sizes and consistent quality require a competent supply partner like **DEKOMTE**.



Circulating Fluidised Bed (CFB) Boilers



Fluidised Bed Combustion (FBC) is a combustion technology used to burn solid fuels. In its most basic form, fuel particles are suspended in a hot, bubbling fluid bed of ash and other particulate materials (for instance, sand, limestone, etc) through which jets of air are blown to provide the oxygen required for combustion or gasification.

The resultant fast and intimate mixing of gas and solids promotes rapid heat transfer and chemical reactions within the bed. FBC plants are capable of burning a variety of low-grade solid fuels, including most types of coal and woody biomass, at high efficiency and without the necessity for expensive fuel preparation (e.g. pulverising). In addition, for any given thermal duty, FBCs are smaller than the equivalent conventional furnace, so they may offer significant advantages over the latter in terms of cost and flexibility.

FBC reduces the amount of sulphur emitted in the form of SO_x emissions. Limestone is used to precipitate out sulphate during combustion,

which also allows more efficient heat transfer from the boiler to the apparatus used to capture the heat energy (usually water tubes). The heated precipitate coming in direct contact with the tubes (heating by conduction) increases the efficiency. Since this allows coal plants to burn at cooler temperatures also causes increased Polycyclic Aromatic Hydrocarbon (PAH) emissions. FBC boilers can burn fuels other than coal, and the lower temperatures of combustion have other added benefits as well.

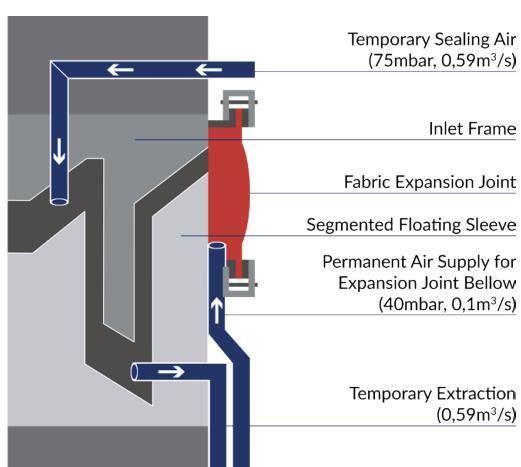
High dust concentration in coal-fired duct systems requires an innovative solution to stop the dust ingressing into the expansion joint.



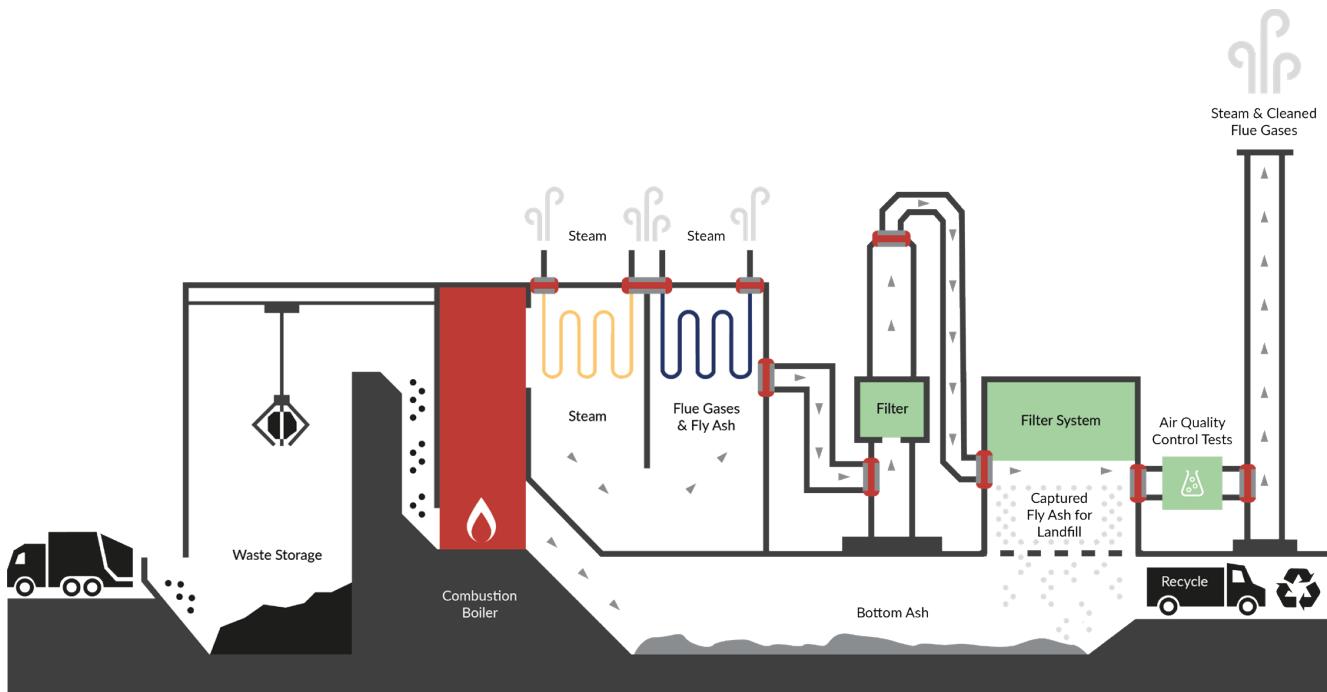
The critical problem with expansion joints is the temperature variance and gradients. Dust on the steel parts can cause flash and cool spots, leading to shortening the life of the joint. By using general purpose site utility air, a sealing cushion of air can be created at the joint, eliminating dust ingress and maximising life.

In a CFB boiler, the outlet from the cyclone requires a sophisticated expansion joint solution that uses sealing air to avoid ash entering into the breach space required for the movement.

The approach of DEKOMTE to look at the larger engineering challenge demonstrates an integrated design concept that delivers value and lifetime to the end client.



Biomass and Waste to Energy (WTE)



A Waste-to-Energy plant is a waste management facility that combusts wastes to produce electricity. This type of power plant is sometimes called a trash-to-energy, municipal waste incineration, energy recovery, or resource recovery plant. The principal operation of this facility is the same as a conventional boiler Rankine cycle design.

Biomass is an industry term for getting energy by burning wood and other organic matter. Burning biomass releases carbon emissions but has been classed as a renewable energy source in the EU and UN legal frameworks, because plant stocks can be replaced with new growth. It has become popular among coal power stations, which switch from coal to biomass in order to convert to renewable energy generation without wasting existing generating plant and infrastructure.

As an energy source, biomass can either produce heat directly via combustion, or indirectly after converting it to various forms

of biofuel. Conversion of biomass to biofuel can be achieved by different methods which are broadly classified into thermal, chemical, and biochemical.

Waste-to-Energy or Energy-from-Waste is the process of generating energy in the form of electricity and/or heat from the primary treatment of waste. Most WTE processes produce electricity and/or heat directly through combustion, or produce a combustible fuel commodity, such as methane, methanol, ethanol or synthetic fuels.

The combustion of organic material such as waste with energy recovery is the most common WTE implementation. All new WTE plants in OECD countries incinerating waste (residual MSW, commercial, industrial or RDF) must meet strict emission standards, including those on nitrogen oxides (NOx), sulphur dioxide (SO₂), heavy metals and dioxins. Hence, modern incineration plants are vastly different from old types, some of which neither recovered energy nor materials.



Modern incinerators reduce the volume of the original waste by 95-96 percent, depending upon composition and degree of recovery of materials such as metals from the ash for recycling.



DEKOMTE expansion joints can be used in the following locations of a plant:

Expansion Joint Applications:

- Bag house
- Boiler grate
- Boiler penetrations and duct connections
- Main boiler ducting
- Ventilation ducts

Ash and corrosion within the ducting poses a serious challenge to the life and gas tightness of fabric joints within the plant. Utilisation of increased internal protection and the latest fabric and pillow construction techniques are essential for reliability.



Fabric Expansion Joints

DEKOMTE supplies quality fabric expansion joints, made from many different materials. In principle, fabric expansion joints are best for gaseous media, such as air, exhaust gas and solvent fumes, particularly for operation below the dew point, in acidic environments, or for abrasive exhaust gases (e.g. containing coal dust).

Fabric expansion joints are often multi-layer systems, consisting of:

- Temperature and corrosion-resistant insulating fabrics
- Gas impermeable films, including:
 - » Foils - stainless, aluminium or Inconel
 - » PTFE and composites
 - » Silicone and rubber
- UV and water-resistant materials for external protection

Part of the construction must also consider the supporting mechanical layers to give strength for maintaining the shape and resist pressure (normally internally, but also under negative pressure).



The overall form and shape of the joint is designed and constructed solely for the allowable movements required. Caution should be taken in any additional movement flexibility outside the specified movement criteria.

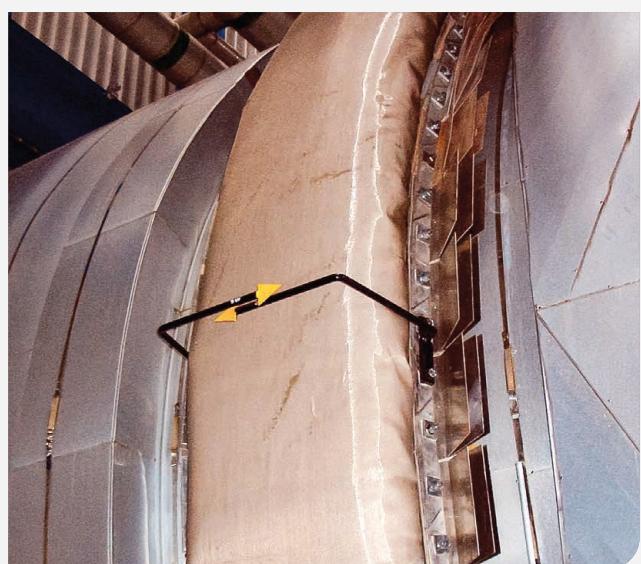
Repairs and Maintenance

An advantage of fabric expansion joints is the ability to patch, repair and replace in sections, thus minimising the downtime or outage. DEKOMTE service approach gives reliable technical advice on what can be repaired and what must be replaced. Considerations to be taken are:

- Damage can be repaired in spot cases to bridge to the next scheduled outage
- Cold-casing application joints can be repaired with low risk and good reliability
- Reliability of repairs can be difficult to achieve in high temperature applications

When an inspection is made, the fabric replacement can be planned to coincide with outage schedules. The upgrading of materials, composition, fixing systems or internal parts can give an important impact on longer life and more durable expansion joints.

A thorough evaluation of the adjacent ducting is required to minimise modification to the duct or steel parts.





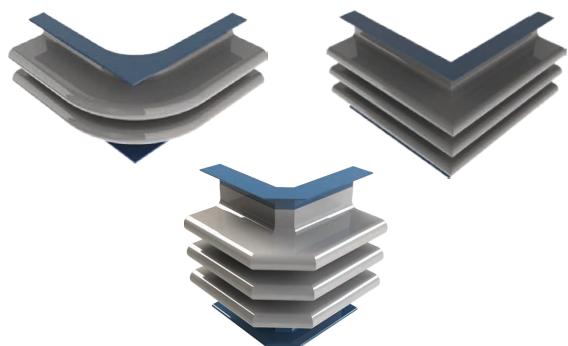
Single-Layer Metallic Expansion Joints

DEKOMTE single-layer metallic expansion joints are individually engineered and manufactured. The laminated construction method facilitates a variety of shapes and boasts no welded corners or larger duct cross-sections.



Corner Design

Typically, three different corner designs are available: round corners, miter corners, or double miter corners. The choice of corners is based on the cycle life and life cycle requirements.



Multi-Layer Metallic Expansion Joints

Multi-layer metallic bellows have a greater flexibility, high cycling capability and gas tightness; opposed to thick-walled single-layer metallic expansion joints. Normally constructed with 1 to 6 layers of stainless or other high alloy steels.

DEKOMTE can supply multi-layer metallic expansion joints with weld ends, fixed flange, loose or threaded connections in accordance with German and international standards. Special connections according to customer drawings are also possible.

Depending on the requirements, the connecting parts and anchorages are made of carbon steel, stainless and acid-resistant stainless steel or heat-resistant steel.



PTFE Expansion Joints

DEKOMTE supplies a range of PTFE expansion joints for use in special chemical and industrial applications. The two main options are:

- Low pressure Type R-LD.
- High pressure Type R-HD.

PTFE multi-laminated tubes that ensure an absolute minimum porosity and a homogeneous wall-thickness, are transformed

again under temperature and pressure to special high-quality bellows, with a high vacuum and pressure resistance, even during a long period of operation.



Rubber Expansion Joints

Rubber expansion joints are universal expansion joints for axial, lateral and angular movements; available with full developed rubber flanges and revolving steel flanges.

The single convolution bellow is made from different rubber qualities with pressure carrying reinforcing high tensile Polyamid cord or as an alternative with reinforced layers of Aramid or fibreglass.

Additional steel or alloy rings may also be used in high pressure applications to avoid distortion of the shape and function of the bellow.



Flexible Hoses

DEKOMTE stainless steel corrugated hoses are high-quality, very flexible and sealed components for pipeline engineering.

DEKOMTE stainless steel corrugated hoses can be used universally for practically all liquid and gaseous media as well as pumpable solids, optionally with PTFE lining as protection against particularly aggressive media or to achieve a non-adhesive inner wall.



Scope of Supply - Design for Integration

DEKOMTE fabric expansion joints are available in any geometric shape (round, square, oval, multi-sided) and in any size.

The scope of design responsibility is a key aspect of DEKOMTE philosophy for an integrated solution to the adjacent duct; this ensures no weakness in the steel frame, liner plate or insulation system.



A metal frame, flow plate, liner system, backing bars, fixings and insulation all form part of the scope that creates a reliable expansion joint. DEKOMTE is able to consider the impacts of turbulent flow, pressure variations, vibration to the expansion joint and the surrounding environment.

External features such as heat convectors for a reliable fixing system, can be a key design aspect for the fabric and clamping area to function.

Adjacent jacketed insulation systems can be used to aid the interfaces to external ducting telemetry or insulation.

Personnel guards and external protection equipment can be integrated with the expansion joint to give a package of supply and make the installation as straight forward as possible.

Formed Solutions

DEKOMTE manufacture bespoke tailor-made solutions, utilising moulds and forms that create an expansion joint to a desired shape. The purpose of a mould is to allow movements to take place without any creasing or folding of materials.

A smooth and formed joint maintains a constant and even surface temperature which reduces the thermal stress and any fatigue to the materials and important gas membrane.

Formed joints are essential in all high movement requirements, where creasing causes rapid material degradation and failure.



Technical Services, Inspection & Installation

Design Studies and Technical Support

Design comparison, investigation and modelling can be achieved using the extensive database of empirical knowledge at DEKOMTE. We offer objective technical support at short notice for critical problems.



Engineering Services

DEKOMTE pushes the boundaries of product development with the latest computer and industry best practice tools and procedures.

The discerning use of Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD), together with 2D and 3D design software, allows a correlation of on-site empirical experience and theoretical models. The formulation of specifications, tenders and design critique are also offered as an independent technical service.

Inspection and Maintenance

DEKOMTE has experienced site engineers and designers who are able to review all expansion joints in a plant. We produce a technical report for maintenance planning and plant improvement, establishing a baseline of the sites expansion joints and helping to build a plan to reduce total costs. This includes:

- Visual and thermographic inspection
- Create a condition report on all existing joints on the plant:
 - » Evaluation of fixing system and gas tightness
 - » Review of adjacent elements for corrosion, cracking or distortion
 - » Internal review of expansion joint, including the flow plate and lining systems



Turnkey Installation

The use of skilled design engineers, technicians, and service engineers, together with qualified on-site skilled labour means DEKOMTE offers a complete turnkey contracting solution for duct problems.

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