Braden Systems for Gas Turbines
Braden...The GT OEMs’ First Choice

For the last 45 years, Braden Manufacturing has occupied a unique spot halfway between the gas turbine OEMs and power producers. No other company has spent more time listening, learning, and working with both groups. As a result, Braden has established itself as the most experienced and trusted name in the design of auxiliary systems for GT power plants. Turbine manufacturers acknowledge that no other company is better equipped to handle the challenges of GT plants:

- Air Filtration
- Inlet Cooling / Heating
- Silencing
- Exhaust & Inlet Ductwork
- Diverter Dampers
- Simple Cycle SCRs
- Expansion Joints
- Bypass Stacks
- Diffusers & Plenums
- Installation provided by Williams Industrial Services
- Inspection & Reporting Services

Site-Specific Design Goals

Every project begins with careful listening...listening to determine actual needs, so as not to over or under-design.

Overall design considerations (simple or combined cycle; turbine selection; site layout, etc.) are only the beginning. An analysis of plant site’s weather data determines the inlet air treatment designs. It also influences material selection for various fabrications (e.g. stainless vs. mild steel).

Construction parameters are carefully developed. Transportation routes of pre-fabricated modules are fully-mapped out. Manufacturing sites, from Braden’s extensive international network of fabricators, are selected based on technical expertise, proximity to the installation and any “local content” regulations.
Engineering Based on Analysis & Real World Experience

Braden engineers work exclusively on GT plant designs. The engineering disciplines are further specialized into system groups:

- Filter Houses
- Inlet Cooling Systems
- Anti-Icing Systems
- Ductwork/Expansion Joints
- Diverter Dampers
- Silencers
- Exhaust Stacks
- SCR/CO Catalyst Systems

Braden’s Engineering Toolbox:

- 3-D Solid Modeling of Complex Shapes
- Computational Fluid Dynamics (CFD)
- Structural Design Analysis
- Thermal, Buckling and Vibration Frequency Analysis
- Finite Element Analysis (FEA)
- Acoustical Testing and Analysis
**Filter Houses**

**The Preferred Choice**

Braden filter houses are the preferred choice of OEM’s for new installations and the favorite choice of GT owners retrofitting their systems. With proprietary designs and numerous global manufacturing locations to satisfy local content requirements, Braden can provide an outstanding solution.

- Filter Houses
- Inlet Cooling / Heating Coils
- Evaporative Coolers
- Over 700 Filter Houses Built

*Korea – 7FA filter houses*

*Research and development facility for pulse filter design excellence*

*China – 9FA pulse filter house*
Appropriate Application vs. Site Conditions

Site conditions are a key factor in selecting your optimal solution. Braden pulse (self-cleaning) filtration systems have been engineered to help gas turbines and generators maintain optimum output. Conditions range from desert to industrial to extreme low temperature northern locations. Braden static (barrier) designs offer excellent protection to your turbine or generator within marine, urban, or coastal conditions.
Let Braden Engineer a Superior Inlet System

Designing a great air inlet is all about attention to acoustics and pressure drop. Our experienced staff of acoustical engineers employs the most modern software to provide compliant designs. Computational Fluid Dynamics (CFD) as well as Finite Element Analysis (FEA), 3-D Solid Modeling, and Thermal, Buckling and Vibration Frequency Analysis are applied to guarantee superior pressure drop, distribution and velocities.

Inlet System Components

- Inlet Plenum
- Inlet Silencers
- Inlet Dampers Doors (Roll Up)
- Inlet Ducting
- Inlet Expansion Joints
- Over 700 Inlet Systems Built
Braden filters are standard on many OEM-supplied filter houses, because Braden manufactures the highest quality filters for Gas Turbine and Compressor Intake Systems available on the market today!

Braden Filters are approved for all GT classes, including ultra-efficient large frame turbines. Our TriCel™ Final Barrier Filters combine high volumetric air flow and extremely low pressure drop along with the dust-holding capacities required by the newest generation of super efficient GTs. Call us for: prefilters, coalescers, barrier final filters and self-cleaning pulse filters.

Braden expansion joint designs provide extended service life over old designs, often employing ceramic insulation for dramatic temperature reductions (See page 13 for detail)

Braden supplies a complete range of aftermarket parts, including gauges, evaporative media liner material, gasket material, insulation/ceramic fiber and hardware kits.
The OEMs’ Preferred Choice

Braden is a major supplier of gas turbine exhaust stacks and diffusers for turbine original equipment manufacturers. Whether the project is located in our backyard or on the opposite side of the world, Braden is the OEMs’ preferred choice. Braden’s exhaust system design experience is based on over 1,000 gas turbine exhaust systems and 40+ years of design innovations. For this reason Braden is often selected to design and fabricate the first exhaust components when new turbine models are introduced.

Qatar – SGT5-4000F exhaust system transport

USA – 7FA exhaust system

Qatar – 9FA exhaust system

Indonesia – SGT4-2000E exhaust system

Peru – SGT6-4000F exhaust system
**Diffusers Designed for Severe Conditions**

Exhaust diffusers must be designed to withstand severe turbulence at the GT outlet. Braden increases the liner thickness, decreases the spacing on the liner plate supports (scallop bars), and uses smaller liner sheet sizes to provide the most robust liner system possible. The shell design and support system for the diffusers are carefully engineered to handle the pressure loads.

**Exhaust Silencers**

- Low frequency design experts
- High reliability
- Long service life

**Exhaust Systems**

- Simple-cycle stacks
- Bypass stacks with diverters
- High temperature designs
Diverter Experience from the Extreme World of Combined Cycle

Braden has designed and manufactured diverter isolators since 1985. The bulk of our diverter experience is in combined-cycle gas turbine power plants, where extreme and sudden thermal changes necessitate thorough design foresight. We have also designed diverters for desulfurization (FGD) applications with several unique and patented features for improved flow distribution.
Design Features

- Flexible Inconel® seal elements
- Toggle or pivot drive system operation
- Thermal stress-free blade design
- Internal casing insulation
- Delivery in one piece or split into sections as per transportation limits
- Hydraulic power units with HRSG protection mode

High Performance

The requirements for diverter design have multiplied dramatically due to increases in mass flow and exhaust gas temperatures combined with more operating cycles. The Braden Diverter design greatly reduces thermal stress, the cause of damage and leakage. Whether you have the latest high end gas turbine or a smaller unit, we can insure long time reliability and performance.

- “F” Class technology
- High reliability
- FEM analysis of all internal load / thermal stress-related
- Extensive experience
- The OEM’s preferred choice
- Over 2000 diverter dampers built
A La Carte or Turnkey

Braden can design a single retrofit system, or build you an entire GT plant from scratch...it’s your choice. Braden supplies the necessary financial and logistical data to help you decide on our level of involvement.

On-Time, On-Budget, On-Target

Braden’s supervision of materials, procedures, and personnel means single-source responsibility for each construction event under contract. Our specialized construction knowledge base minimizes erection time and costs, and puts your plant on target to achieve peak power performance as quick as possible.
Braden has developed new retrofit designs that will drastically reduce external heat transfer, making the Plenum/Wing/Cowl/Expansion Joint area safer, more efficient and easier to operate and maintain. These retrofit designs can be applied to plenums of all sizes.

Let Braden’s Retrofit Engineers show you how these design improvements can help your system. A typical retrofit unit can be installed in one to two weeks during a scheduled maintenance outage, with the diffuser and turbine shaft in place.

Braden offers the manpower, equipment and experience to install on your site...or we can provide detailed erection drawings and procedures for your own crew.
The combination of SCR technology, coupled with Braden’s international fabrication and exhaust structural design expertise is a formula for customer success.

World Leading NO\textsubscript{x}/CO Reduction Solutions

Braden can supply a comprehensive NO\textsubscript{x}/CO reduction solution for your simple cycle plant. Drawing on our extensive experience as the world’s leader in the design of exhaust silencers and stacks, we offer “complete system” capability:

- Flow modeling
- Ammonia systems
- NO\textsubscript{x} and CO catalyst
- Acoustic design / thermal stress analysis
- Catalyst grid design
- Controls

Simple cycle SCR and CO system on LM 6000 gas turbine
## Manufacturing Locations

- Argentina
- Bahrain
- China
- Egypt
- Germany
- India
- Indonesia
- Israel
- Italy
- Korea
- Malaysia
- Mexico
- Netherlands
- Poland
- Romania
- Saudi Arabia
- Spain
- Thailand
- Turkey
- UAE
- USA
The Global Power Companies

Leaders in Providing Custom-Engineered Auxiliary Equipment and Support Services for the Global Power Generation Industry

**Braden Manufacturing, LLC**
Global leader in design, manufacture and installation of auxiliary equipment for gas turbines

**Consolidated Fabricators, LLC**
Design and manufacturing of complex mechanical, electrical and fluid systems

**Koontz-Wagner**
Design, construction and electrical integration of packaged control rooms

**TOG Manufacturing**
Manufacturer of precision machined parts for gas and steam turbines

**Williams Industrial Services Group, LLC**
General and specialty construction, maintenance and modification, plant management and support services for nuclear, hydro and fossil power generation

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