Why Just Replace when you can Upgrade?

Retrofits and Upgrades to Improve Efficiency & Reliability of Your Gas Turbine System
Our Upgraded Designs Provide Improved Efficiency and Reliability over Original Equipment

When any of your Gas Turbine Auxiliary Systems need to be replaced, repaired or upgraded, you shouldn’t settle for “Same As” equipment. Take advantage of the opportunity to upgrade with an improved design from Braden or Consolidated Fabricators!

The GT OEM’s First Choice

Braden is uniquely qualified to provide an upgrade to any of your Gas Turbine (also known as Combustion Turbine) Auxiliary Systems. As the preferred supplier to GT OEM’s for over 50 years, chances are that we built your original system. As designs, specifications, and construction techniques have evolved, Braden’s engineers have been at the forefront of improvements. Today, we are capable of delivering gas turbine auxiliaries that are demonstrably better than those that came with your original system. An improved, modern retrofit from Braden draws from our full array of structural, mechanical, electrical, and acoustical engineers to optimize your plant.

On-Time, On-Budget, On-Target

Braden’s supervision of materials, procedures, and personnel means single-source responsibility for each construction event under contract. For turnkey projects, our approach minimizes erection time and costs and puts your plant on target to achieve peak power performance as quickly as possible.

Our Unique Perspective

Our experience and background enables us to look at the “big picture” as we understand how all the subsystems work together to enhance the performance of your gas turbine. Our equipment recommendations are based on an understanding of your overall plant.

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- Inlet Damper Systems
- Replacement Filters

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Before — FS-3 filter house (no filtration)

After — FS-3 filter house (with mist eliminators, pre-filters, and final filters)
Our New Diffuser Designs Deliver Longer Life and More Reliability

Design Enhancements Improve Fatigue Life
Our designs reduce first and second mode fundamental vibration frequencies to help deliver improved fatigue life.
- Select components have increased material thickness
- All welding is 100% penetration with root pass NDT
- Diffuser is manufactured in a fixture to ensure dimensional integrity
- Load tunnel insulation liner offers several enhancements over the original equipment to prevent premature failures related to sagging insulation and vibration excitation of the load tunnel liner

Integrated Exhaust Systems to Deliver Optimal Performance
We can provide a complete integrated system for a gas turbine exhaust, designed to operate efficiently together. By combining a plenum with the diffuser and hardware, we can assure a safer, more efficient and easier-to-operate system.

Services to Assist Diffuser Upgrades
Rely on us to help with the whole process:
- Initial site survey
- Removal of old plenum, diffuser, and seals
- Installation of new equipment
- Testing of equipment with plant running

Support Parts, Refurbishment and Reverse Engineering
We can supply all parts and equipment for your upgrade. When necessary, we can reverse-engineer existing equipment that needs to be upgraded.

Diffusers for all Frames 3, 5, 6, 7 and 9 GTs are available

Upgrade Your Exhaust Plenum, Diffuser and Aft Wall Flex Seals
Failure of your existing equipment could result in a forced shutdown, outage or damage to instrumentation in the load tunnel and load compartment. Ask us about a comprehensive approach to address these issues:
- Leakage of excess heat into the load compartment
- Cracking of the exterior shell plate due to high differential temperatures

Other OEM designs are available upon request

Materials are selected to suit operating conditions and can include:
- 300 or 400 Series stainless steels
- High Strength Low Alloy (HSLA) steels
- Carbon steels
We maintain all welding capabilities.
Modern Designs Improve Plenum Safety & Efficiency

Much has changed since your existing plenum was built. Today, our new retrofit designs drastically reduce heat transfer, making the plenum/wing/cowl/expansion joint area safer, more efficient, reliable and easier to operate and maintain. These retrofit designs can be applied to plenums of all sizes.

Ask About Our “Bullet-Proof” Plenums! Designed for GTs that never come offline, these beefed-up plenums are the ultimate in reliability when you just can’t afford to be down.

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 at your site...or we can provide detailed erection drawings and procedures for your own crew.

Plenum Upgrades Can Include:
- Plenum, wing, cowl, jacking port, radiation tubes, flex seals and all necessary hardware
- Reline kits are available!

Integrated Exhaust Systems
Braden and ConFab together can provide a complete integrated system for gas turbine exhaust, designed to operate efficiently together. By combining a diffuser and hardware with the exhaust plenum, we can assure a safer, more efficient, and easier-to-operate system.

Frame 3, 5, 6, 7 & 9 Plenums
- Latest designs allow the plenum and exhaust to remain in place during normal maintenance outages
- Designed to reduce outage time which in turn reduces cost
- More robust flange design
- Better thermal design and performance
- Reduced shell plate temperature to help extend the plenum life cycle
- Upgraded liner design helps protect the flex seal mounting bar from heat, distortion, separation of the flanges, and bent flex seals
- Upgraded corner trim at wing and cowl connection
- Designed for all types of operation (base load to cyclic load)

With hundreds in operation, we have perfected the internally lined exhaust plenum system, which took years of field research and inspections as well as visiting with our customers. Braden has developed plenums for all OEM turbine sizes that are both easy to install and easy to dismantle for turbine maintenance. Our field splits are also fully internally lined and insulated to significantly reduce the external shell plate temperatures. This equates to a safe work environment and a product with a much longer life span.

Plenums for SGTs and V84 GTs are also available

Liner system for field split, designed for easy maintenance
Exhaust Stack Retrofits

Have you changed your process and now have different exhaust temperatures exiting the stack?
Do you have corrosion from the elements? Or is your stack just worn out?

Equipment that can be provided:
- Simple cycle stacks
- Bypass stacks
- Ladders and platforms
- Combined cycle stacks

Stack Damper Retrofits

Keep the elements outside with a counter-balanced, heat traced, durable, easy-to-install stack damper. These are ideal for high snowfall locations and will help speed wintertime start-ups.

Diverter Dampers

Diverter Experience from the Extreme World of Combined Cycle

Braden has designed and manufactured diverter dampers 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.

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

Improve Acoustics with a New Stack Liner Design

Our modern stack designs feature a “floating liner system,” a significant upgrade to previous methods. Thermal growth and stress are minimized by new, smaller liner sheets of 409SS material.

Braden has perfected a floating liner system that provides internal system stability in high turbulence, high temperature environments such as F class machines. Additionally, each design is evaluated for internal pin spacing, pin size, liner plate thickness, and clamping system positioning to ensure system integrity.

State-of-the-Art Acoustical Solutions

Our acoustical capabilities, backed up with extensive laboratory and field measurements, allow us to develop state-of-the-art solutions for your noise control requirements. We have created designs to meet noise requirements in the far field, near field, stack exit, total system sound power, low frequency emissions and more. Our silencer baffles have been extensively modeled and tested to survive the harshest conditions created by modern turbines. This includes our new baffle design optimized for the fast turbine startups of F class machines.

Exhaust Stack Retrofits and Diverter Dampers

Exhaust Stack Retrofits

Before — FS-5 exhaust stack replacement

Diverter Dampers

GT35E2 diverter

The requirements for diverter design have multiplied dramatically due to increases in mass flow and exhaust gas temperatures combined with more operation cycles. The Braden 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 ensure long-time reliability and performance.

- “F” and “H” class technology
- High-reliability
- FEM analysis of all internal load / thermal stress-related
- Extensive experience
- OEM’s preferred choice
- Over 250 diverter dampers built

Stack Liners and Silencer Panels

Exhaust Stack Retrofits and Diverter Dampers

Exhaust Stack Retrofits

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Braden is Widely Acclaimed by Gas Turbine OEMs as the World Leader in GT Inlet Cooling & Heating Technologies

Our engineers have extensive experience and knowledge with providing innovative solutions on inlet filter house systems based on specific environmental and end user requirements. We have produced hundreds of top quality, cost-effective systems of filtration and auxiliary equipment that clean and condition the air at low pressure drop for optimum power output while protecting the compressor from damages by foreign objects.

**Inlet Heating Systems**

Braden has successfully designed and executed a variety of comprehensive inlet heating systems around the world to provide for anti-icing, turbine emissions control, or even increasing part load thermal efficiency... all based upon specific customer needs.

**Filtration Systems**

Braden has a filtration system that can be adapted to your existing gas turbine system, whether it be a salt removal package or sub-micron chemical dust removal. Our systems include the following:

- Intake hoods for weather protection (e.g. rain or snow elimination)
- Mist elimination and coalescing filters
- Static filter systems (pre-filters to high efficiency final filters)
- Pulse filter systems (self-cleaning)
- Combination filtration systems
- Salt removal package
- Sub-micron particulate filtration

Braden can provide a system that your plant can easily control to meet its specific temperature needs from steam to air heat exchangers, water/glycol and air coils, high and low pressure bleed air anti-icing systems. Braden can also design and manufacture heat exchanger skids to suit your needs.

**Implosion Door Retrofits**

Avoid a turbine trip caused by extreme delta P with Braden’s implosion door retrofits. Our implosion doors are designed to mechanically open at pre-determined delta P to let unfiltered air into the inlet of the gas turbine, bypassing the filters. Designs may include mechanical switches that alert the control room when the door has been activated to allow the operator to make the appropriate decision.

**Inlet Cooling Systems**

Braden has extensive experience in providing media-based evaporative coolers to both our OEM and Aftermarket customers. Our system includes a total solution package comprising module housings, cooler media and drift eliminators, interconnecting piping system, and system controls that can be integrated with your existing turbine control center or can be set up to operate automatically using a PLC. Braden can offer solutions ranging from 88% to 98% saturation effectiveness using higher face velocity media up to 750 feet per minute.

**Inlet Chilling Systems**

Braden can provide inlet chilling solutions that can be added to your system to meet your peak MW demand and obtain an air outlet temperature as low as 45°F. Braden engineers have years of experience in CFD and thermal modeling of inlet chilling systems and are equipped with the latest finite element and volume analysis tools, heat transfer and thermodynamic modeling software to design an integrated system that meets your requirements. Braden can provide the complete scope, chiller housing, coils, condensate mitigation, transitions, piping and controls.
Scr & Co Catalyst Systems for Simple Cycle Plants

Put Our Experience to Work in Your Next NOx/CO Reduction Project

Extensive Experience
The combination of Braden SCR technology, coupled with our international fabrication capabilities and exhaust structural design expertise, is a formula for customer success. Our expertise includes the design and supply of dozens of catalyst systems. We have experience with over a thousand exhaust systems, including both stacks and silencers. In addition to exhaust structural engineering, we:

- Design SCR control systems
- Analyze flow by using state-of-the-art CFD modeling
- Analyze structural decisions by using elaborate finite element analysis
- Meet customer’s noise criteria by using sophisticated acoustic design programs
- Create our own electrical and mechanical designs

Flow Management
In the current environment of high conversion efficiencies and low ammonia slip levels, proper flow distribution is absolutely essential to catalyst system performance. We model all NOx and CO catalyst systems to verify proper flow distribution through the catalyst, ensuring that specified reduction levels are met. Total system pressure drop is also a key design consideration which is controlled by proper design of the ductwork and silencing systems.

Ammonia Systems
Braden has extensive experience with both aqueous and anhydrous ammonia systems and can supply either type to meet your plant needs. Solutions that can be provided are hot gas recirculation units or electric heater atomization units. Our usual scope of supply includes ammonia/air dilution skid, ammonia piping and balancing header and Ammonia Injection Grid (AIG). The skids come completely shop-fabricated, insulated and wired for fast and simple installation at the jobsite.

Silencing and Thermal Stress Analysis
Noise attenuation is often critical to the design of catalyst systems. Braden’s in-house acoustic engineers have designed many systems to meet challenging low-noise criteria.
Step Up to a Superior Flex Seal

Our flex seals are designed for the specific application, taking into consideration operating temperature, relative moments, and insulation systems thereby resulting in optimized material selection, geometry, and heat loss.

We’ve improved the OEM design of the flex seal to manage the thermal expansion in the turbine exhaust. The Inconel® seal flexes back and forth every time the turbine is cycled, providing greater protection for nearby equipment from exhaust leaks.

• Full and partial kits available
• Cost-effective solution
• Complete turnkey installation available
• Expedited shipping available
• Total kits including insulation available
• Wider designs available (field trimmed) to fit distorted units

Our Most Common Kits
FS-6: ASTM-A240 304SS and ASTM-A240 409SS materials
7F: Inconel® 718 and ASTM-A240 409SS materials
7EA: ASTM-A240 304SS material

Other OEM designs are also available

Custom-Engineered Penetration Seals to Fit Your Application

Our HRSG penetration seals are designed for the specific application, taking into consideration operating temperature, HRSG location (roof, side walls, or floor), maximum expansion/contraction, and vibration or lateral movements. No matter what configuration, we can engineer an HRSG penetration seal to fit your application!

Don’t Just Replace the Belt… Fix the Root Cause of the Belt Failure

Our Engineers Will Come to Your Site and Do an EJ Analysis and Engineer a Superior Product

 Braden will inspect and locate why your belt failed and provide a comprehensive kit to address the problem…complete with belt, hardware, studs and insulation.

Improvements that can be made:
• Absorption of vibration/shock
• Fix for minor misalignment of ductwork
• Corrosion resistance
• Can be designed for easy removal during plant maintenance
• Temperature abatement

Expansion Joint Locations on Gas Turbines:
• Filter house
• HRSG inlet
• GT exhaust outlet
• Exhaust stack

Only Need a Belt Section?
If you have an area that is damaged or ripped, Braden can evaluate and provide a belt section that can be spliced to your existing material. This saves on the cost of replacing the entire expansion joint belt.
Gas Turbine and Auxiliary Enclosure Replacements and Replacement Doors & Panels

Ask the Upgrade Experts for a Highly Functional Enclosure to Replace What You’ve Got

Chances are, your enclosures never really got a lot of thought when they were first built. Understandably, the equipment inside got first priority. As your installation ages, however, there is no reason to settle for a “same as” design when the enclosure is replaced. Let us show you how much a well-design solution can help your operation.

GT SmartDoor™ Products: Better Function, Easier to Order, Attractive Pricing

Repairing or replacing damaged, corroded or worn-out gas turbine enclosure doors or panels has traditionally been a frustrating, time-consuming and expensive chore. Due to the non-standardized, welded fabrications, each old door or panel required its own engineering drawing and complex manufacturing sequence and factory assembly that eliminated any opportunity for on-site modification. GT SmartDoor products represent a whole new approach to enclosure maintenance: a better door or panel, that’s easy to order and can be re-insulated or re-gasketed on-site to maintain thermal and acoustic performance.

- Formed plate door exterior eliminates welded construction — the only welding is for stud-welded attachments
- Tadpole gasket is firmly secured by clamping bar (not glued), allowing precise control of pressure on seal to make a seamless door seal
- Bolted design allows easy re-insulation or repair on-site
- Standardized insulation tubes
- Improved hardware, including an exclusive latch for doors that open with handles on same post for suicide doors
- Multiple construction material options available, including stainless steel

Easy to Order, Easier to Install

- No OEM door or panel drawings needed!
- Just fill in our easy-to-use standardized form with the required dimensions...we’ll ask for just what’s needed.
- Bolted “plug & play” installation... no welding required.

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Need customization? We can add windows, scanner boxes and vents to any door.
Inlet Damper Systems

Solutions for Moisture-Rich and Cold Environments

Moisture-rich environments can cause unnecessary corrosion and erosion to internal components on Gas Turbine (GT) inlet and compressor components. Blades, vanes, and other components can see moisture pitting and staining leading to decreased efficiency. Another problem in cold environments is that the HRSG cannot retain heat from escaping without closing off the inlet system.

With that in mind, Braden designed its inlet damper systems to deliver conditioned air between the filter house and gas turbine for typical use when the GT is shut down or is on turning gear for an extended period of time. Our system is built to the following codes: ASME, ASTM, AWS, NFPA, NRTL cert., NEC, IEC, and NEMA.

Inlet Damper Door

Used primarily to seal off the GT internals from the outside environment.

Natural air convection from stack draft effect causes air to continue to flow through the inlet, GT, and exhaust duct when shut down or on turning gear.

Technical Design:
- Minimal leakage design
- Stainless steel or carbon steel construction
- 30-year design life

Dehumidifier Skid

Used in conjunction with the inlet damper door to provide dehumidified air to the GT internals (a heater skid can also be provided).

Technical Design:
- Connected to inlet system by interconnecting piping
- PLC-controlled safety system to prevent fire, component damage, and if there is any blockage in the system
- 30-year design life

Replacement Filters

ExCel® Pulsed GT Inlet Filters

ExCel Premier Web: The Best Balance of Performance and Value

ExCel premier web filters are F9, MERV 15 rated, (efficiencies >70% @ 0.4 µm) meeting EN779-2012. Their custom engineered 100% synthetic non-woven media technology provides:
- Optimized design for the most challenging pulse jet cleaning applications
- 100% mechanical filtration technology (no “special fabric treatments” that quickly wear off)
- Surface filtration technology
- Hydrophobic performance with maximum wet strength
- Durable construction using mechanical glue bead pleat separation

Outstanding Performance for Base Load and Peakers

Switch to ExCel premier web filters to stabilize pressure drop and improve filtration efficiencies while avoiding the “ultra premium” pricing of triple layer filters.

TriCel® Barrier Final Filters

Braden’s TriCel® high-efficiency barrier filter is specifically designed for gas turbine air intake applications. Using the latest manufacturing techniques in filter media and pleating, the TriCel filter provides high volumetric airflow with extremely low pressure drop.

Prefilters & Coalescing Filters

Bradens offers a wide range of prefilters and coalescers/ prefilters for a variety of airflow conditions, including re-usable plastic frames for high moisture applications.

Dehumidifier Skid

ExCel premier web filters employ surface loading media technology to provide longer life and easier pulsed cleaning

Other filters use depth loading which traps particulate deep into the media, making cleaning difficult

AIR FLOW
Turnkey Solutions.
Integrated System Knowledge.