BD Energy Systems
A BD Group Industries Company

Products

Steam Methane Reformers

Steam Methane Reformers remain our core market with our engineers having extensive experience encompassing process design, detailed design, and construction expertise of all major technology licensors. BD Energy Systems have executed more than 90 steam methane reformer projects which include lump-sum revamp and turn-key EPC projects and cover a full range of equipment supply and services:

- Engineering and capital supply of Steam Methane Reformers
- Furnace Relocations
- Catalyst tubes – Redesign and/or Replacement-In-kind
- Transferlines – Redesign and/or Replacement-In-kind (Water jacketed and Refractory lined)
- Convection Section Revamp – Design and Supply for higher overall thermal efficiency
- Combustion Air Preheaters – Engineering & Supply
- Selective Catalytic Reduction (SCR) System
- Selective Non-Catalytic Reduction (SNCR) System
- Low and Ultra-low NOx Burner Retrofits
- Tube Growth Monitor (TGM) System
- Firebox Tunnel replacement
  - Conventional Brick
  - Tunnel Optimal Performance Technology (TOP)
- Process and Feasibility Studies – Efficiency improvements & Capacity Increase
- Construction/Construction Advisory Services
- Turnaround Planning & Scheduling
- Start-Up & Commissioning Services
- Steam Methane Reformer Training
- Syngas Plant - Operations Review and Training
- Emergency Field Services and/or Supply of in-kind replacement of furnace coils or parts
- Engineering services – Redesign of firebox refractory, improvement of penthouse ventilation, etc.

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Products

Transfer Lines

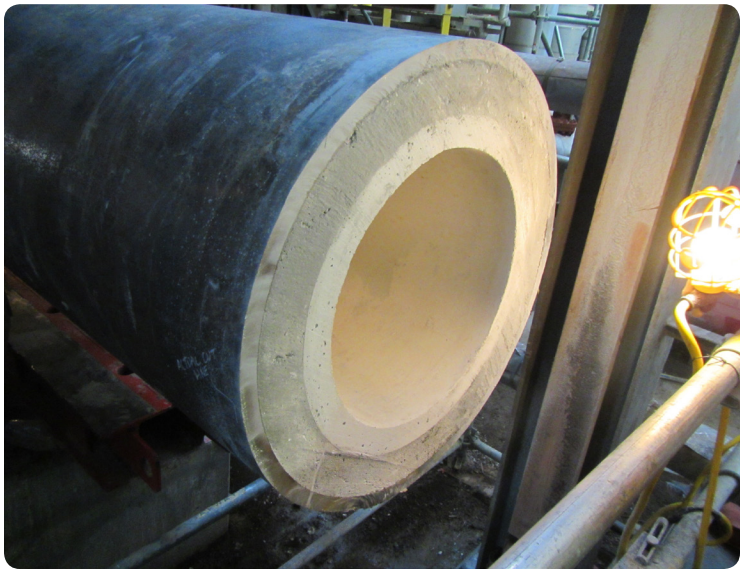
BD Energy Systems over the years have executed engineering, supply and construction (EPC) of various types of Transferlines for existing and new plants.

Tranfer Line Variants:

- Dual Refractory Type
- Refractory Lined with External Water Jacket
- Refractory Lined with Metal Liner

Transfer Line Services:

- Detailed engineering package, including thermal design calculations
- Pipe wall thickness, stress calculations and pipe support design
- Mechanical flexibility analysis
- Refractory design and thickness calculations
- Fabrication and inspections in compliance with industry and local codes
- In-house licensed engineers to provide professional engineering checks and seals
- Installation of transfer lines



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Selective Catalytic Reduction Units (SCR)

Our Selective Catalytic Reduction (SCR) systems feature industry-leading NOx reduction rates and efficiency capabilities that allow end users to confidently meet the increasingly strict requirements of regulating bodies worldwide.

Our systems utilize direct injection of anhydrous or aqueous ammonia into the flue gas upstream of a catalyst bed. The use of flow modulation devices such as Vortex Generating Mixers allow even distribution of reagent within the flue gas regardless of the complexity of the ducting, minimizing the amount of injection points and reducing the ammonia slip.

These highly variable systems can be installed as standalone units or upstream of an APH to guarantee that the performance of a given unit meets the specific needs of a project, regardless of application or reduction requirements. Each component to be provided is built to scale and extensively flow tested to ensure that after installation the unit will perform as designed.

With over a dozen SCR systems of different designs currently in operation at various petrochemical and refinery applications, BD Energy Systems is recognized as a leader in SCR equipment and technologies.

BD Energy Systems can provide SCR system using either aqueous or anhydrous ammonia. BD Energy Systems' SCR system can reach up to 97% efficiency within a single reactor.

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Selective Non-Catalytic Reduction Units (SNCR)

The Selective Non-Catalytic Reduction system is a proven technology that converts NOx into N2 and H2O by injecting reagents at high temperature without the need of a catalyst. The system can achieve surprisingly high reduction rates without the use of additional catalyst provided the process offers the correct temperature range.

In an SNCR, the reagents, typically aqueous ammonia or urea, are injected directly into the existing flue gas duct or fire box using water as a carrier in order to cover the entire cross section in the correct temperature range.

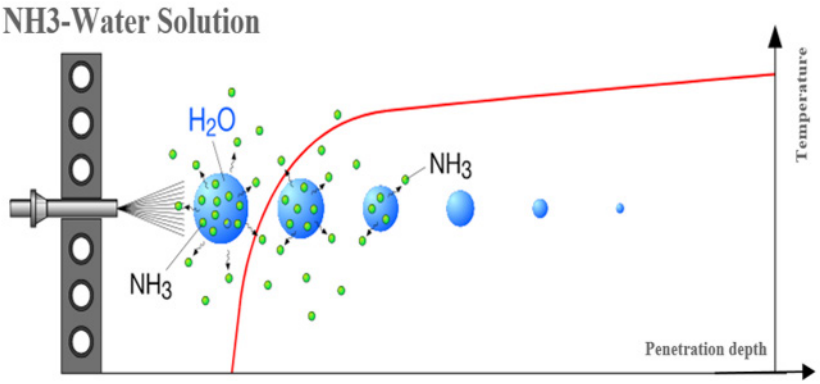
The SNCR is the simplest and most economical form of NOx-reducing technology and is best suited for applications where a modest NOx reduction of 30-40% is required together with tight schedules and limited plot space where the flue gas temperatures are high enough (895°C-1100°C) to promote the reactions. The SNCR can be further used in combination with a SCR system where the ammonia slip is used in a downstream SCR bed, so called "slip barrier".

SNCR is the reaction of ammonia releasing reduction agents (ammonia water or carbamin) with nitrogen monoxide (NO) and nitrogen dioxide (NO2) at temperatures of usually 850-1050°C directly into the firebox and according to the following overall reaction:

$$\text{Urea} + 2\,NO + {}^1/_2\,O_2 \rightarrow 2\,N_2 + 3\,H_2O$$

OR

$$2NH_3 + 2NO + {}^1/_2O_2 \rightarrow 2N_2 + 3H_2O$$



Spraying nozzles are injecting the NH3-Water solution into the flue gas. The water will evaporate and leave the gaseous NH3 to react with the NOx.

Advantages:

The lances are not inside of the furnace / flue gas duct and remain protected in vicinity of the wall. Retrofit easily possible.

Disadvantages:

- NH3 distribution is difficult to predict. For aqueous NH3 and urea solutions large quantities of water are required, leading to loss of energy.

Equipment Features

- Lower Capital Cost
- Small Plot Plan
- Rapid Installation
- No Expensive Catalyst to Replace
- High Reduction Rates of NOx in appropriate conditions

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Air Preheaters

BD Heat Recovery Division (A sister company of BD Energy Systems,LLC.), Inc. provides a variety of air preheater (APH) units to service the heat recovery & efficiency requirements of customers in a wide array of industries. Our APH systems feature robust, plate-type heat exchanger design that utilize fully welded and sealed plates to ensure leak-free operation. When installed downstream of fired equipment, our APH systems are able to recover waste heat and recycle it back into the process through the incoming combustion air, thereby increasing overall efficiency and decreasing operating costs.

Our HEATEX®-based APH systems feature a cross-flow plate-type heat exchanger design that utilizes fully welded, bent plates to achieve the required heat transfer. Incredibly robust by nature, the HEATEX® excels in lower-efficiency applications or in applications prone to more particle-laden flue gas streams that would foul other heat exchanger styles.

The HEATEX® is a highly customizable system and can be altered in size, material, and arrangement based on available space and process requirements. It also has the option to be staged, allowing the incoming air to create several passes across the transfer plates, thereby increasing overall efficiency.

Compact (Gas/Air) or (Gas/Gas) heat exchangers feature a counter-flow plate-type heat exchanger design utilizing fully welded, dimpled plates as the heating surface. Our counter-flow systems provide unparalleled heat recovery efficiency while maintaining the most compact installation footprint possible.

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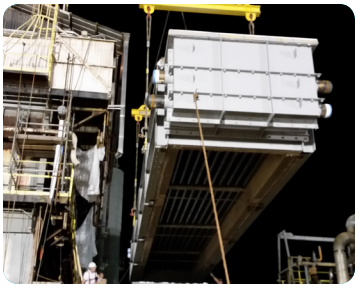
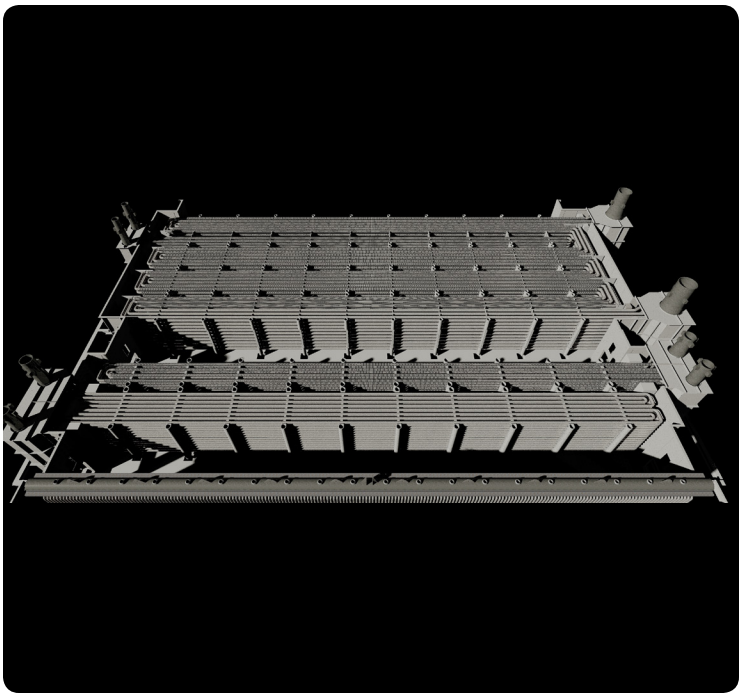
Products

Waste Heat Recovery Units

Waste Heat Recovery Units can be used to produce additional steam or to heat process fluids, fuel, or combustion air utilizing the heat in flue gas streams. As experts in fired equipment, BD Energy Systems utilizes the high volume of flue gases coming from furnaces, boilers, and gas turbines to improve the plant's overall efficiency.

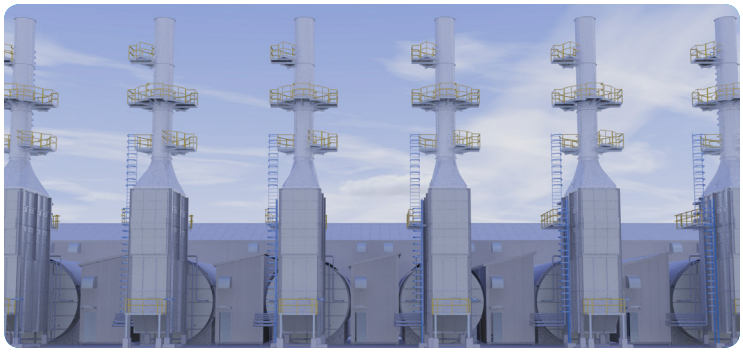
BD Energy Systems scope of work includes performance studies, engineering design services, supply of waste heat recovery units along with construction advisory and/or construction management including commissioning and start-up services.

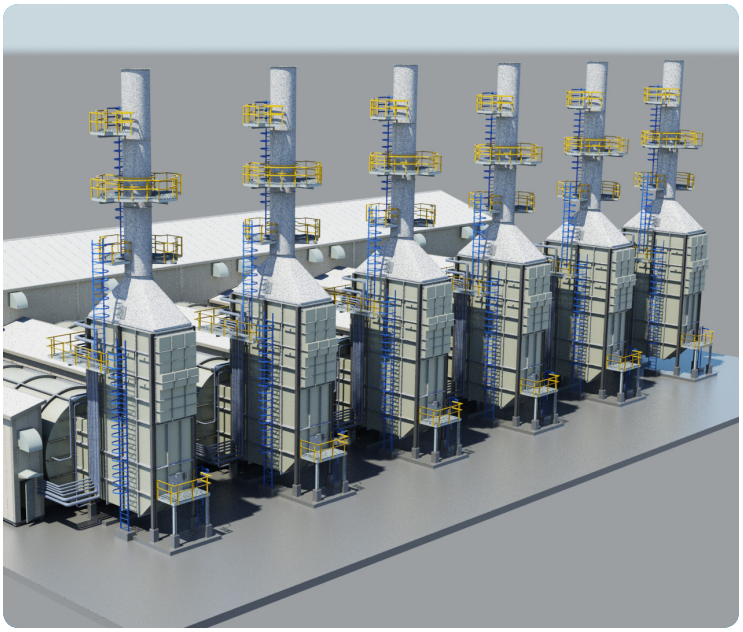




Once Through Steam Generators

BD Energy Systems has experience with Once Through Steam Generators and their associated skid equipment for heavy oil enhanced recovery. Our company offers the full range of services necessary for the design, supply, and installation of OTSGs including; Engineering Design & Study, Project Management, Subcontracting, Scheduling & Planning, Quality Assurance & Control, and Supervision & Advisory Services.





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Fired Heaters

As specialists in various process heaters, BD Energy Systems services include the analysis, design, supply, and construction of fired heaters for a variety of applications, including:

- Atmospheric Furnaces
- Vacuum Distillation Unit Furnaces
- Hot Oil Heaters
- Platforming Heaters
- Propane Dehydrogenation Heaters (PDH)
- Coker Heaters
- Process Gas Heaters (such as DRI Reheat/ Reforming furnaces)
- Once Through Steam Generators (OTSG)

With an interest in improved thermal efficiency and reduced emissions, new and existing plants alike are increasingly wanting to explore the inclusion or addition of Low or Ultra-low NOx burners, SCR systems, and Air Preheaters. BD Energy Systems, together with BD Heat Recovery, a leading supplier of compact Combustion Air Preheaters, provides a full range of solutions for both existing and new fired heater projects. BD Energy Systems capabilities in executing a turn-key project worldwide offers great advantage to clients who wants to execute lump sum projects.

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Pyrolysis Furnaces

Steam cracking of saturated hydrocarbons is the common means for producing ethylene and propylene for the petrochemical industry. At BD Energy Systems, our engineers have experience in the design, construction, and operation of a range of steam cracking furnace technologies.

Services Offered:

- Engineering and capital supply of Cracking furnaces
- Transfer Line Exchanger (TLE) Replacement
- Operational & Run-Length improvements
- Radiant & Convection Section Revamp
- Addition of Selective Catalytic Reduction (SCR) system
- Construction Advisory Services
- Turnaround Planning & Scheduling
- Start-Up & Commissioning Services
- Process and Feasibility Studies
- Basic Engineering Packages

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