

# POWER

## POWER GENERATION



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Kennametal Stellite is a global provider of solutions for wear, heat, and corrosion problems, a world-class manufacturer of components, and a service provider for the power generation market. These parts are produced through different processes such as casting and machining, and can be custom engineered to meet individual customer needs. In addition, Kennametal Stellite offers its expertise and experience in coating services in the form of HVOF (High-Velocity Oxy Fuel) coatings and weld Hardfacings.

Kennametal Stellite offers its proven heat, wear, and corrosion experience and customized solutions in the power generation market for a broad range of applications, including:

- **Industrial Gas Turbines**
- **Steam Turbines**
- **Nuclear Plants**
- **Hot Gas Expanders**



# Industrial Gas Turbines

A typical gas turbine environment involves high temperatures, rapid gas flow rates, high pressure, and a complex mixture of aggressive gases.

Kennametal Stellite offers a wide selection of cobalt, nickel, stainless steel, and super-alloys to combat heat, abrasion, and corrosion in even the most demanding applications.

We are specialists in supplying products for industrial gas turbines such as blades and vanes, heat shields, structural combustor parts and hot gas path components, as well as coating and machining services.

Advanced, air-cooled rotating airfoils and stationary nozzles, with thin and complex ceramic cores, are manufactured using the lost wax process and casting, both in air melt and under vacuum.

We use a variety of alloys for finished pieces including Hastelloy™, René™ and Mar-M™ nickel alloys, Stellite™ cobalt alloys, Udimet® alloy, and Inconel™ alloy.

From simple cycle to combined cycle to co-generation gas turbines, our wide range of products and processes can solve even your most difficult wear problems.





## Steam

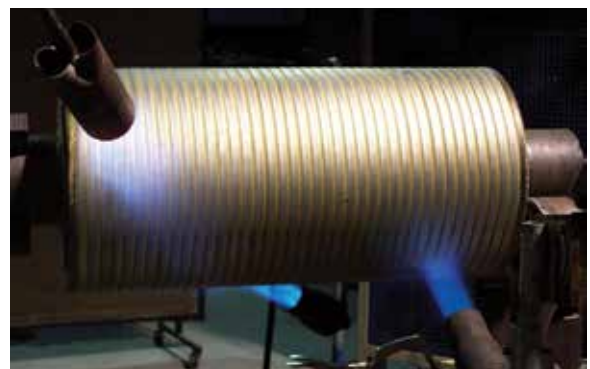
Kennametal Stellite alloys for steam turbines in conventional and nuclear power plants are used in different control valves within the hot steam path. These components are exposed to high forces like heat (up to more than 600°C), corrosion, and erosion. Kennametal Stellite delivers cast and coated components, and can provide base material as needed. Typical components in steam turbine control valves and cooling water pumps are:

- **Diffuser**
- **Bushing**
- **Valve seat and spindle**
- **Guide bushing**
- **Piston ring**
- **Steam strainer**
- **Air box**
- **Support block and shroud block**
- **Finish machining service for complex geometries and challenging alloys**

Typical alloys used include Stellite™ alloy 21, Stellite™ alloy 6, JK™ 7184, and JK™ 7391.

## Erosion Shields

Some steam turbine designs will see water droplet formation in the L-0 region of the low-pressure turbine. These water droplets may cause erosion on the leading edge of the largest turbine blades. In turn, erosion can lead to catastrophic failure from crack propagation across the blade. Kennametal Stellite erosion shields, welded or brazed to the leading edge of these L-0 blades, slows water droplet erosion and crack propagation so that issues can be detected and repaired during regular inspections. Erosion shields are typically made from Stellite™ alloy 6B or from cast Stellite materials. Ask your OEM or Service provider about the benefits of Kennametal Stellite erosion shields in your steam turbine.





## Nuclear

Kennametal Stellite produces components used in the control rod mechanisms for several current nuclear plant designs as well as components for valves and pumps within the primary and secondary steam cycle. These are high-reliability components that remain in service for several decades. These components are typically made from Stellite™ alloy 6, Stellite™ alloy 6B, Inconel™ alloy 718, or Norem™ alloy B2 materials. Together, Norem™ alloy B2 and Inconel™ alloy 718 provide a no-cobalt solution for European application. In addition, many steam-handling components and valve surfaces benefit from the use of Stellite materials. Please see the Steam section of this document for more information.

## Hot Gas Expanders

Hot Gas Expanders (or Turbo Expanders) use waste heat energy in an exhaust gas path to turn a rotor and generate electricity or perform mechanical work within the industrial facility.

Hot Gas Expanders, particularly those used in FCCU (Fluid Catalytic Cracking Unit) applications where high-temperature gas contains catalyst materials, benefit from the use of Kennametal Stellite materials on blades and vanes to reduce erosion and extend service life.





## Hardfacing Alloys

Kennametal Stellite offers a wide range of wear-and corrosion-resistant alloys that perform well at very high temperatures. These alloys are formulated from elemental compositions comprising of a metal matrix and hard phase of carbides, borides, and others.

Stellite™ alloys (Co-Cr-W-C) are the most popular and widely used alloys. They combine excellent mechanical wear resistance, especially at high temperatures, with very good corrosion resistance. The lower carbon alloys are usually selected for abrasion, severe galling, or low angle erosion. Stellite™ alloy 6, Stellite™ alloy 12, and Stellite™ alloy 21 are commonly used to hardface valve components in the Power Generation industry.

Deloro™ alloys (Ni-Cr-B-Si) offer very effective corrosion and abrasion resistance with high-temperature hardness, and in some cases can be good substitutes for Stellite™. The higher hardness Deloro™ alloys are used in severe wear applications, and they can be blended with carbides for an even harder deposit.

Tribaloy™ alloys, with either nickel or cobalt base, were developed for applications in which extreme wear is combined with high temperatures and corrosive media. The high Molybdenum content accounts for the excellent dry-running properties of Tribaloy™ alloys.

Most of these alloys are widely used as consumables for thermal coating. These alloys are available in various forms (depending on alloy range and application process), eg. coated rods for manual arc hardfacing, bare rods for oxy-acetylene and Tungsten Inert Gas (TIG) welding, powder for Plasma Transferred Arc (PTA) and wire for Metal Inert Gas (MIG) welding.

Please visit our website, [www.kennametal.com/stellite](http://www.kennametal.com/stellite) for a full range of our consumables. We also offer customer specific solutions for any consumable requirement.

Alloys	Common Application in Power Generation
Stellite™ alloy 6	Valve and Seat Bearings, Erosion Shields
Stellite™ alloy 21	Valve and Seat Bearings, Erosion Shields
Stellite™ alloy 306	Valve Discs, Bearings
Deloro™ alloy 40	Industrial Valves
Tribaloy™ alloy T-700	Nuclear Application

## Capabilities

### **Casting:**

Investment casting  
Resin shell casting  
Centrifugal casting  
Sand casting  
Vacuum casting

### **Coating:**

HVOF (JetKote™-HVOF)  
Plasma spraying  
Flame spraying  
Manual metal arc welding  
TIG welding  
PTA welding

### **Powder Metallurgy Components**

### **Stellite™ alloy 6B Machined Components**

### **Full Machine Shop Capability**

## Certifications

AS9100B  
ISO 9001:2008  
NADCAP – RT, PT  
10 CFR 50 Appendix B  
NCA 3800  
Various Customer-Specific Certifications

## POWER GENERATION

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