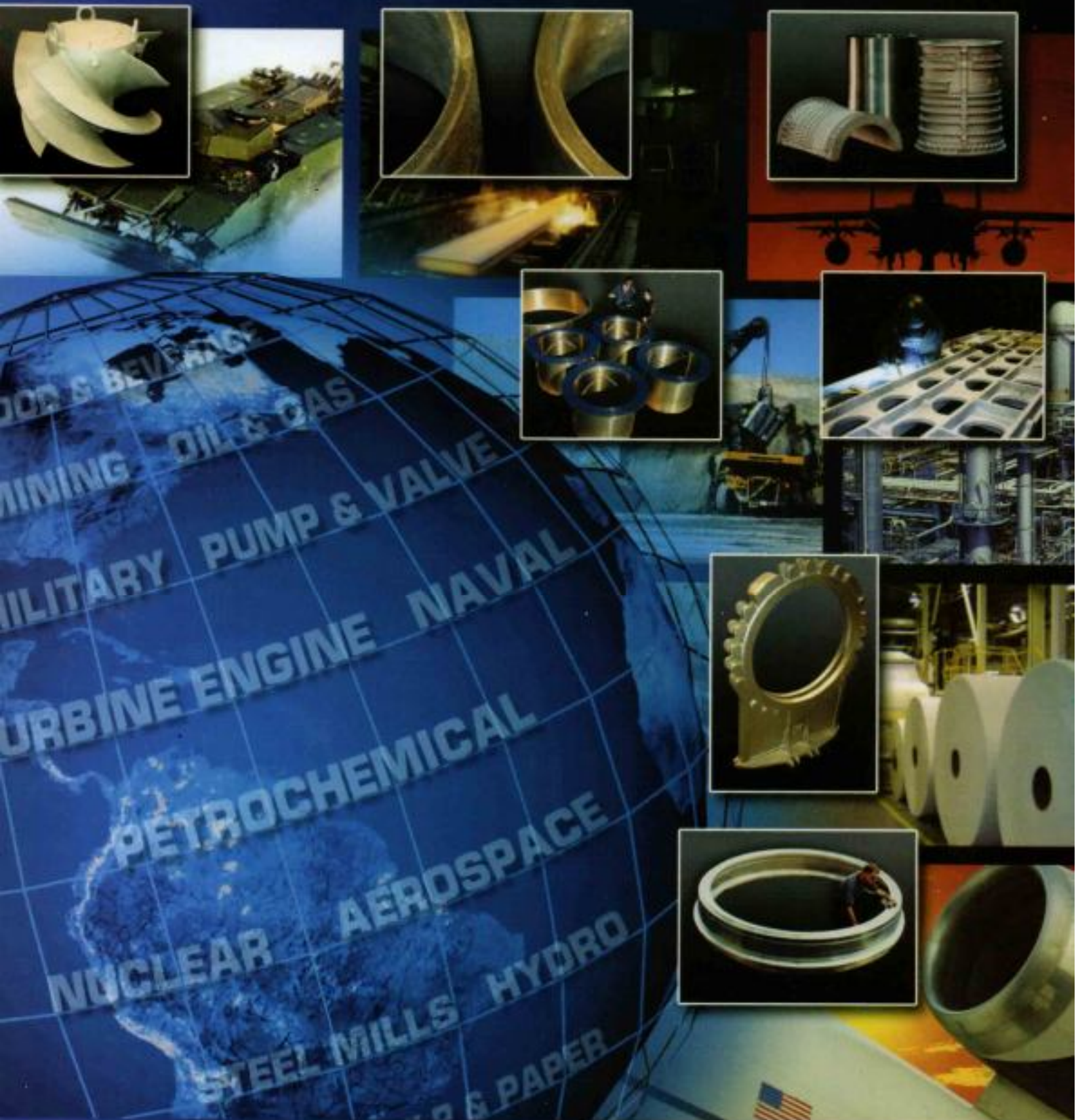


## WELCOME TO METALTEK

YOUR BEST COMPONENT SOLUTION SOURCE



# WISCONSIN CENTRIFUGAL

## HEAT, CORROSION, & WEAR RESISTANT SOLUTIONS FOR INDUSTRIES AND APPLICATIONS WORLDWIDE

### A FEW EXAMPLES OF HOW WISCONSIN CENTRIFUGAL HELPS CUSTOMERS: REFORMER FURNACES

#### MANIFOLD ASSEMBLIES

Outlet manifolds in petrochemical plants collect hot gases which escape reaction tubes in reformer furnaces. These manifolds must perform at extreme temperatures (up to 1,650°F / 900°C) for years without replacement. Previously made from wrought alloy 800H, today MetalTek's 20-32Nb centrifugally cast alloy has become the material of choice because it offers superior creep resistance while retaining excellent aged-ductility, reducing long-term maintenance costs. They can be custom produced in a fraction of the time required for forged or extruded manifolds.



#### HIGH STRENGTH GEAR BLANKS

A designer of offshore drilling equipment was using C863 manganese bronze gear blanks for heavy applications because of its excellent corrosion resistance and strength. The customer turned to MetalTek to modify the alloy and process in order to consistently meet an even higher standard. Exceptionally stringent metallurgical control and innovative in-process testing regulates each heat, eliminates scrap and rework, and provides a product that performs beyond expectations.

#### OIL & GAS



#### DEEP GROOVE MACHINED PART

MetalTek is renowned for converting multiple piece fabrications into single castings. For this primary quench exchanger reducer, we eliminated the need for a heat treated weld in a high temperature environment and developed a way to economically machine an 8" deep groove in this 12" part. MetalTek's fully integrated operation created the conversion, deployed proprietary tooling, specialized fixturing and tool head concepts to reduce manufacturing time by 70%. Combined with the elevated properties and grain structure of a centrifugal casting, a new cost effective yet superior solution was delivered.

#### PETRO CHEMICAL



#### CLUTCH WINCH DRUM

Naval replenishment vessels transfer supplies to ships at sea while allowing for motion. High horsepower, continuous slip clutches control the tension of connecting cables. When a change to non-asbestos brake material was mandated, the clutch drums became subject to extreme wear. MetalTek pioneered a Metal Matrix Composite material centrifugally cast for this high friction application virtually eliminating corrosion and wear, and reducing operating cost by 80%.

#### MILITARY



#### BRIQUETTING ROLLS

In high volume industrial, food and pharmaceutical applications, raw materials are pressed between matched briquetting rolls with machined pockets to create a desired product shape. While specifications for wear, corrosion, and thermal properties vary, the soundness and consistency of centrifugal castings are always relied on. MetalTek helps select the correct alloys with thermal conductivity to process materials at desired temperatures. Our experience casting food approved CDA 815 chrome copper material in heavy walled structures provides a readily machinable briquetting roll which ensures consistent product dimensions and long tool life, even when processing dense materials.

#### FOOD PROCESSING



#### FAN CASE TOOLING

Composite and sheet metal structures used in aircraft components and engines are hot-formed around tooling that is typically a welded fabrication. Because of heat and the large size of these structures, tools are prone to deformation resulting in tolerance and roundness issues in the finished part. The homogeneous nature of centrifugally cast tooling and selection of temperature resistant cast alloys eliminates those concerns. The MetalTek fan case tooling, shown, provides five times the tool life of a fabricated assembly.

#### AEROSPACE



#### STEEL MILL ROLLS

During hot-dip galvanizing, steel is passed through a 900°F (480°C) bath of molten zinc. Rolls that guide the steel are subjected to high stress, corrosion, and wear. MetalTek centrifugal castings are ideal rotating components, due to consistent shaping and high metal integrity. Blemishes or latent imperfections that appear in forged or fabricated rolls as they wear are transferred to the steel. Those imperfections are all but eliminated when using centrifugally cast rolls. With MetalTek, the complete roll assembly is available from a single source.

#### STEEL MILLS





**Steam Reformer Assemblies**

Custom engineered alloys, pull bored and built with strict adherence to process control.



**On-Site Turnaround Support**

Extended field fabrication service for primary reformer furnace overhauls.



**Outlet Manifold Assemblies**

deliver rupture strength, aged ductility and value. High quality centrifugal cast tubing and fittings are utilized throughout.

**Vertical Centrifugal Cast and Static Cast Components**

shopmaking for long term performance.

**Centrifugally Cast Reducers**

Centrifugal cast MTek™ materials to match reformer furnace tubes.

**Convection Tube Sheets**

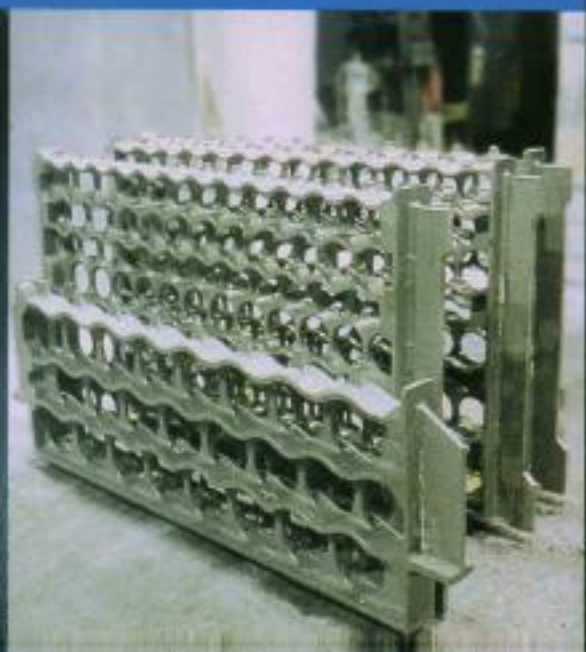
up to 4.2 meters (14 feet) long, 1.5 meters (5 feet) high in all heat resistant grades.

**Radiant Tube Trees**

standing 10 meters (35 feet) tall.

**Transition Cones and Bullhead Tees**

Centrifugally cast MTek™ 20-32Nb.



# Alloy Selection Guide

## High Temperature Petrochemical Furnace Tube Materials

Grade	Specifications		Nominal Chemical Composition (%)					
	ASTM	DIN 17006	C	Cr	Ni	Mn max	Si max	Other
HF	A297/608	<b>G-X 30 CrNiSi 20 10</b>	<b>0.30</b>	<b>20.0</b>	<b>10.0</b>	<b>2.00</b>	<b>2.00</b>	
			Economical heat resistant grade containing sufficient chromium and nickel for good resistance to oxidation. The petrochemical and refining industries use HF alloy convection tube sheets, return bends and ells, burner tips, and gas burner rings. <b>Service limit: 870°C (1600°F)</b>					
HH Type II	A297/447/608	<b>G-X 40 CrNiSi 25 12</b>	<b>0.40</b>	<b>25.0</b>	<b>12.0</b>	<b>2.50</b>	<b>1.75</b>	
			This stable austenitic alloy contains sufficient chromium for scaling resistance at high temperatures. It is suitable for a wide range of high temperature applications including convection tube supports. <b>Service limit: 980°C (1800°F)</b>					
HK 40	A297/351/608	<b>G-X 40 CrNiSi 25 20</b>	<b>0.40</b>	<b>25.0</b>	<b>20.0</b>	<b>2.00</b>	<b>2.00</b>	
			A chromium-nickel grade suitable for low stress reformer catalyst tube design requirements. Increased levels of silicon provide improved carburization resistance to benefit low severity ethylene cracking furnace coils. <b>Service limit: 1025°C (1875°F)</b>					
24-24Nb	—	<b>G-X 35 CrNiSiNb 24 24</b>	<b>0.35</b>	<b>24.0</b>	<b>24.0</b>	<b>2.00</b>	<b>2.00</b>	<b>Nb 1.00</b>
			This alloy exhibits improved stress rupture properties compared to HK 40 and it permits the use of thinner sections and/or higher operating temperatures under the same loads. <b>Service limit: 1025°C (1875°F)</b>					
CT15C 20-32Nb	A351	<b>G-X 10 NiCrNb 32 20</b>	<b>0.10</b>	<b>20.0</b>	<b>32.0</b>	<b>1.50</b>	<b>1.50</b>	<b>Nb 0.80</b>
			This is a low carbon, niobium strengthened alloy with excellent rupture ductility and thermal shock resistance. The material is well suited for collection manifolds, headers and transfer lines. <b>Service limit: 980°C (1800°F)</b>					
HP 25-35	A297	<b>G-X 45 NiCrSi 35 25</b>	<b>0.45</b>	<b>25.0</b>	<b>35.0</b>	<b>2.00</b>	<b>2.50</b>	
			This chromium-nickel grade is an extension of HK alloy with 15% added nickel content. It offers increased strength at elevated temperatures. <b>Service limit: 1050°C (1925°F)</b>					
HP Modified 25-35Nb	A297 Mod	<b>G-X 40 NiCrNb 35 25</b>	<b>0.40</b>	<b>25.0</b>	<b>35.0</b>	<b>1.50</b>	<b>2.00</b>	<b>Nb 1.00</b>
			The addition of niobium improves stress rupture strength through the formation of niobium containing carbides that are more stable at higher temperatures. The presence of niobium improves carburization resistance, but lowers ductility. This alloy is equally well suited in reformer and ethylene furnace applications. <b>Service limit: 1100°C (2010°F)</b>					
HP Mod Low C 25-35LC	A297 Mod	<b>G-X 15 NiCrNb 35 25</b>	<b>0.15</b>	<b>25.0</b>	<b>35.0</b>	<b>1.50</b>	<b>2.00</b>	<b>Nb 1.00</b>
			A low carbon modification of HP Modified with increased ductility, this material is especially suited to pyrolysis furnace sweep bends and reformer furnace outlet manifolds. <b>Service limit: 1050°C (1925°F)</b>					
HP Micro-Alloy 25-35MA	A297 Mod	<b>G-X 40 NiCrNbTi 35 25</b>	<b>0.40</b>	<b>25.0</b>	<b>35.0</b>	<b>2.00</b>	<b>2.50</b>	<b>Nb + Ti 1.20</b>
			A micro-alloyed HP with small additions of titanium and rare earth elements that is especially stable at higher temperatures. This material forms especially tenacious oxide film that reduce surface oxidation. <b>Service limit: 1150°C (2100°F)</b>					

Grade	ASTM	Specifications DIN 17006	Nominal Chemical Composition (%)						
			C	Cr	Ni	Mn max	Si max	Other	
25-35W	A297 Mod	G-X 45 NiCrW 35 25	0.45	25.0	35.0	1.50	2.00	W 3.75	
		This HP alloy is modified with tungsten for increased rupture strength due to the formation of very stable tungsten carbides. A disadvantage of this alloy is its low ductility, particularly after service. It is often used for the hot leg of ethylene furnace coils. Service limit: 1150°C (2100°F)							
25-35CoW	A297 Mod	G-X 45 NiCrCoW 35 25	0.45	25.0	35.0	1.50	2.00	W 5.0 Co 15.0	
		An alloy used in petrochemical applications operating at higher temperatures and pressures than are possible with conventional heat resistant materials. The alloy is widely used in riser sections of reformer harp assemblies. Service limit: 1180°C (2155°F)							
25-35NbW	A297 Mod	G-X 45 NiCrWNb 35 25	0.45	25.0	35.0	1.50	2.00	Nb 1.00 W 3.75	
		This modified HP alloy is modified with tungsten and niobium for high carburization and oxidation resistance. It is especially well suited for hot legs of ethylene cracking coils. Service limit: 1150°C (2100°F)							
28-48WCo	—	G-NiCr28WCo	0.50	28.0	48.0	1.50	2.00	W 5.00 Co 3.00	
		The high nickel content of this alloy combined with additions of tungsten and cobalt produce good high temperature strength and carburization resistance. Applications of this alloy include radiant and convection tube supports and hangers. Service limit: 1180°C (2155°F)							
30-50W	—	G-NiCr 28 W	0.50	28.0	48.0	1.50	2.00	W 4.00	
		A nickel base alloy with tungsten addition that provides exceptional strength. This material also has good resistance to carburization and oxidation. It is used in furnace designs where higher temperatures are required. Service limit: 1165°C (2130°F)							
35-45 Micro-Alloy 35-45MA	—	G-X 40 NiCrNbSiTi 45 35	0.40	35.0	45.0	2.00	2.25	Nb + Ti 1.00	
		Similar to MTek™ 30-50W in high temperature strength and carburization resistance, but without the welding difficulties of a high tungsten alloy. This micro-alloy offers improved aged ductility, plus resistance to metal dusting. It is quite suitable for components operating in hot zones of pyrolysis coils and components of reformer outlet manifolds. Service limit: 1150°C (2100°F)							
50-50Nb	A560	G-NiCr 50 Nb	0.10	50.0	balance	—	—	2.5 max	
		A nickel base high temperature corrosion resistant specialty alloy that resists fuel-ash corrosion, specifically sulfur and vanadium attack. Service limit: 950°C (1740°F)							

# Improved Furnace Tube Performance

## Computer-Controlled Weld Fabrication

New dual synchronous pulse TIG welding delivers superior weld quality and high velocity production.



## Small Diameter Furnace Tubes

Pull bored tubing with 38 mm (1.50") inside diameter.



## CAD and 3-D Modeling

utilizing cutting-edge computer technology.

**M**etalTek International offers an impressive array of engineering and product resources for the petrochemical industry.

**For steam reformers**, 25 Cr - 35 Ni, HP-modified materials with high stress rupture strength deliver longer operating life with reduced wall sections that minimize destructive thermal gradients. Pull bored tubes have smooth, shrinkage-free inside diameters for high thermal efficiency, increased catalyst volume and reduced occurrence of catalyst voids.

**For ethylene pyrolysis**, MTek™ 25 - 35 Nb and 35 - 45 Nb micro-alloys provide strength at high temperatures, excellent carburization resistance and creep rupture strength to avoid hanger support problems, bowing and bulging. A controlled equiaxed grain structure increases grain boundaries contributing to reduced carburization rates. Pull bored tubes have smooth, shrinkage-free inside diameters that eliminate carburization initiation sites.

**For Direct Reduction of Iron (DRI)**, dedicated tooling and facilities at our Wisconsin Centrifugal location provide for the complete casting and production of these reformer tube assemblies. We supply specialty tubes to job sites around the world, for "Greenfield" plants, and for your re-tubing and turn-around needs.

**Extensive fabrication capabilities** include tube, coil and manifold assembly. The latest computer-controlled welding systems give us improved weld fusion levels and consistency.

## Backed By Extensive Process Control

Process control is one of our highest priorities, so it is supported with the most comprehensive control methods in the industry. Quality and control are carefully built in at every step, from order placement through manufacture. Each individual on the team adheres to procedures documented and certified as ISO 9001: 2000 standards. As a result, everything is produced according to the customer's specifications, governing standards of the ASME code, ANSI B31.3, API RP-530, plus applicable local BS, DIN and JIS standards.

## Product Traceability

Leading edge bar code technology tracks components throughout the manufacturing process. Radio communication scanners at each operation tap real-time information to indicate individual component status. These scanners display job, material and cast heat identification, chemistry and lab testing compliance, NDT compliance and production status. This system ensures error-proof traceability of components, and guarantees full compliance with the testing frequencies and testing order that you require.

# THE METALTEK FAMILY OF COMPANIES

MetalTek has nearly 900,000 sq. ft. of manufacturing space under roof, at multiple international facilities.

# MetalTek

INTERNATIONAL

## YOU CAN EXPECT MORE FROM YOUR METAL CASTING RESOURCE.

MetalTek International helps solve metals problems everyday. Not only have we integrated the industry's leading centrifugal, investment, sand, and continuous casting companies to offer you single source responsibility, we've built a better metals company. One that can competitively deliver components which offer superior performance and far greater value for our customers.

Customers benefit from MetalTek's concurrent engineering capabilities and deep metallurgical experience with hundreds of heat, wear and corrosion resistant alloys. We work harder to understand your application, and can recommend the optimal casting and manufacturing method, because we are uniquely positioned to offer them all, including innovative, proprietary hybrids. In-house machining, fabrication, rigorous quality systems, advanced testing and certifications assure the job is done right.

Now you know why many of the world's most successful companies, from virtually every industry, choose MetalTek.

Whether your components are the world's most complex or simple, largest to smallest, you can expect more from your metal casting resource. **Others say it, we do it everyday. Let MetalTek show you.**



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#### ADVANCED ENERGY COMPONENTS

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