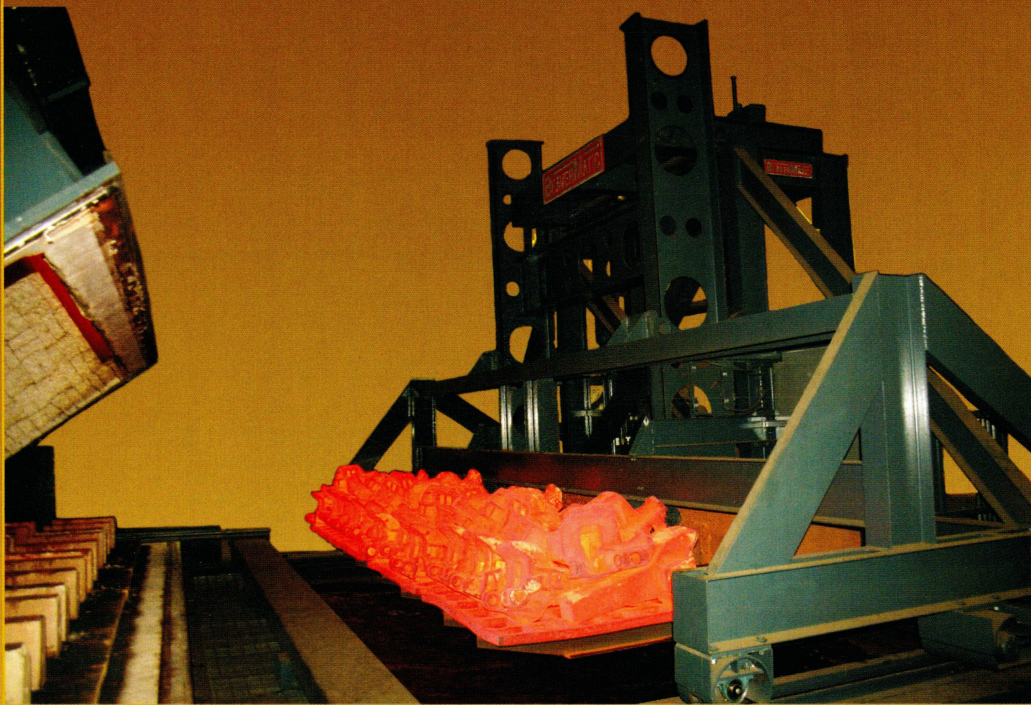




**BeaverMatic**

Highly Reliable and Efficient  
Tip-up Furnace Designs



*Tip-up Furnace System*

## BeaverMatic Tip-up Furnace is Simplistic in Appearance and Operation.

The BeaverMatic Tip-up Furnace is simplistic in appearance and operation since there are no internal transfer mechanisms. Built of heavy gauge structural steel, this precision-engineered powerhouse can be configured to process workloads that weigh up to 100,000 lbs. with ease. Numerous alternatives are available to customize a furnace to meet a company's specific need (temperature, uniformity, process, atmosphere, etc.).

Lightweight ceramic block insulation reduces power consumption and increases throughput and efficiency as a result of faster thermal cycling and reduced heat loss. Furnaces with fans and indirect gas-fired or electric heating systems are ideal for annealing, carburizing, nitriding or nitrocarburizing heavy wire stems, castings, weldments and other components.

For performance proven dependability in handling large payloads, a BeaverMatic Tip-up Furnace has six distinct and sophisticated design features: 1) heating system; 2) fan assemblies; 3) opening mechanism; 4) controls system; 5) manipulator; 6) quench tank, which combined make this furnace highly effective in meeting a wide range of requirements.

### 1: Heating System

The furnaces flexibility starts with the numerous heating systems that are available: direct gas-fired, indirect gas-fired and electric resistance elements.

**Direct gas-fired furnaces** incorporate burners that fire above the work area on one side of the furnace and fire below the work area on the other side of the furnace. Fixed air burners provide excellent temperature uniformity across a wide temperature range and pulse fired burners are highly energy efficient.

**Indirect gas-fired burners** are utilized when processing in inert or reactive processing atmosphere and feature recuperated radiant tube burners. Tubes are positioned along the front and rear walls of the furnace. U-type radiant tube assemblies with external recuperation, and the more efficient single ended radiant tube assemblies with internal recuperation, are available.

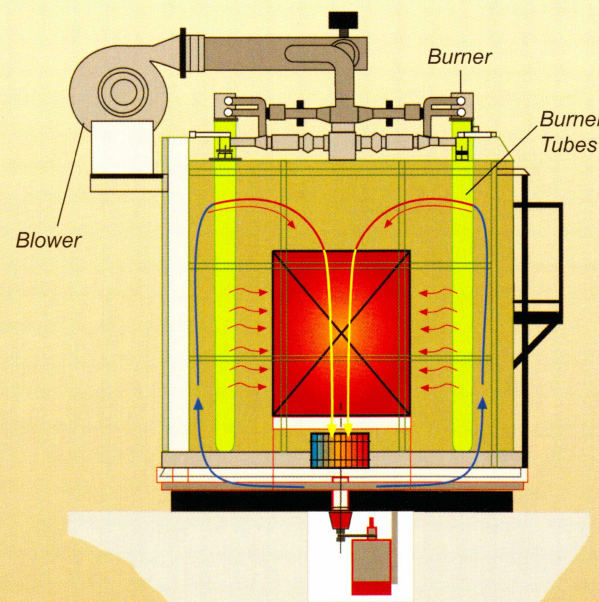
**Electric resistance elements** can be supplied in furnaces. Low watt loading rod overbend elements provide excellent life. Silicon carbide elements installed in radiant tubes simplify replacement.

### 2: Fan Assemblies

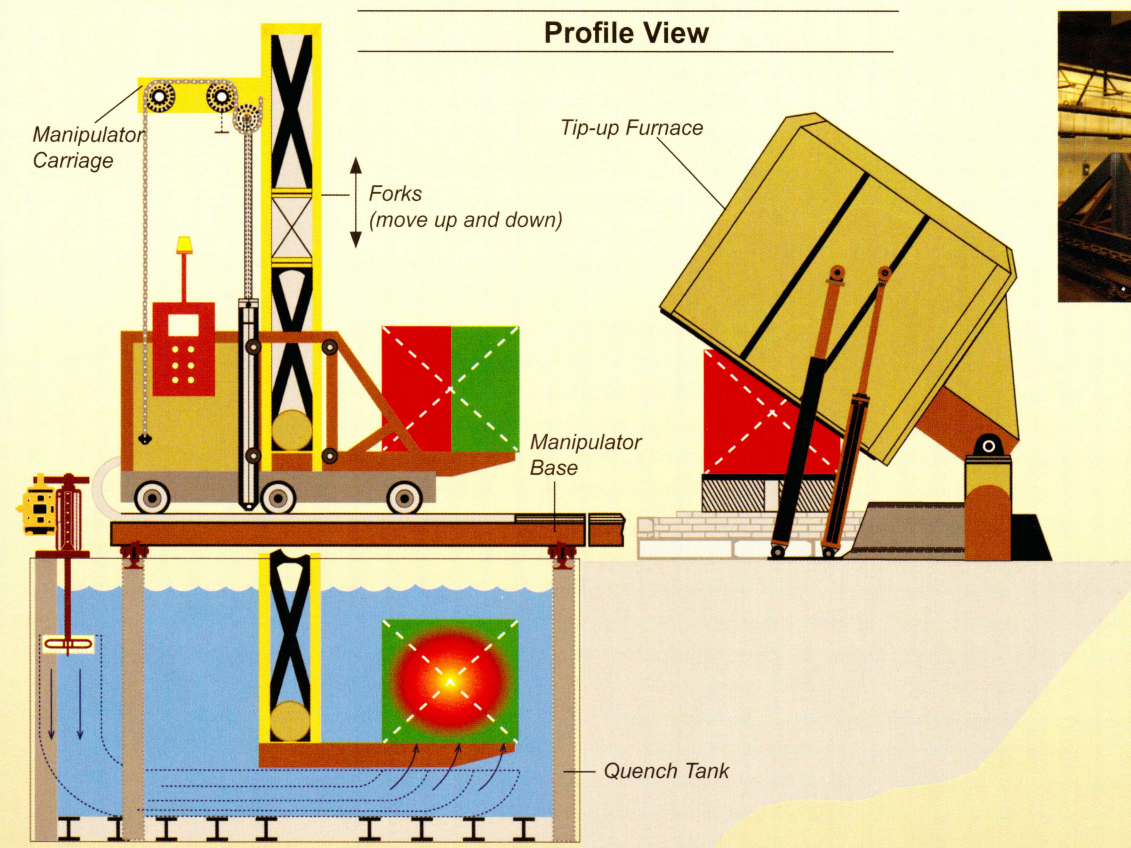
Furnaces with indirect gas-fired or electric heating systems incorporate fan assemblies in the roof or the base to circulate heat and atmosphere through-

out the work area. The success of the forced convection system is due to the volume of air circulation when processing dense workloads.

To meet tight temperature uniformity requirements, high velocity centrifugal fans with a diffuser are mounted in the base and accessible via the pit. The combination of a multi-blade squirrel cage type fan and diffuser, under each load, generates a defined laminar air flow.



**Indirect gas-fired burners:** Fans can be mounted in base, requiring a pit (as shown), or fans can be mounted on furnace ceiling.

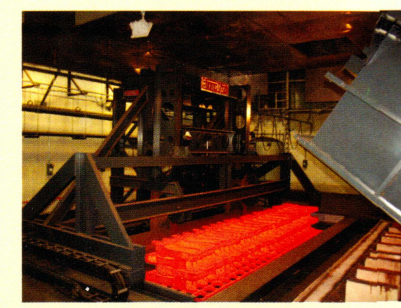


### 3: Opening Mechanism

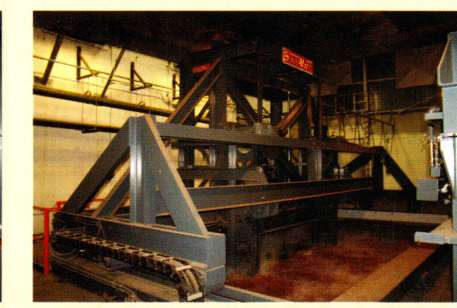
Two hydraulic cylinders pivot the Tip-up Furnace open to allow a BeaverMatic Manipulator or forklift truck to transfer workloads in-and-out. When the furnace is closed, ceramic fiber insulation provides a thermal barrier and a sand trough provides an atmosphere seal on atmosphere furnaces.

### 4: Controls System

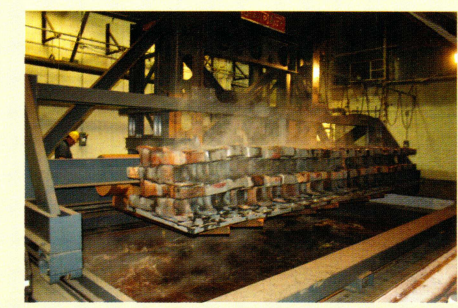
An OIT (operator interface), linked to a PLC, provides a single interface that all control is initiated. The PLC directs and monitors all automation. The OIT enables recipe management, furnace and alarm monitoring, and manual and automatic control via menu driven screens. Recipe management is password protected. In the case of a line, multiple PLCs are linked for handshaking.



Heat treated load picked-up by manipulator in Tip-up Furnace and transferred to quench tank.



Heat treated load being quenched.



Manipulator removing quenched load from quench tank.



Complete Tip-up Furnace System with manipulator.

Multiple phases of the heat treat process, shown in a highly-reliable automated Tip-up Furnace System.

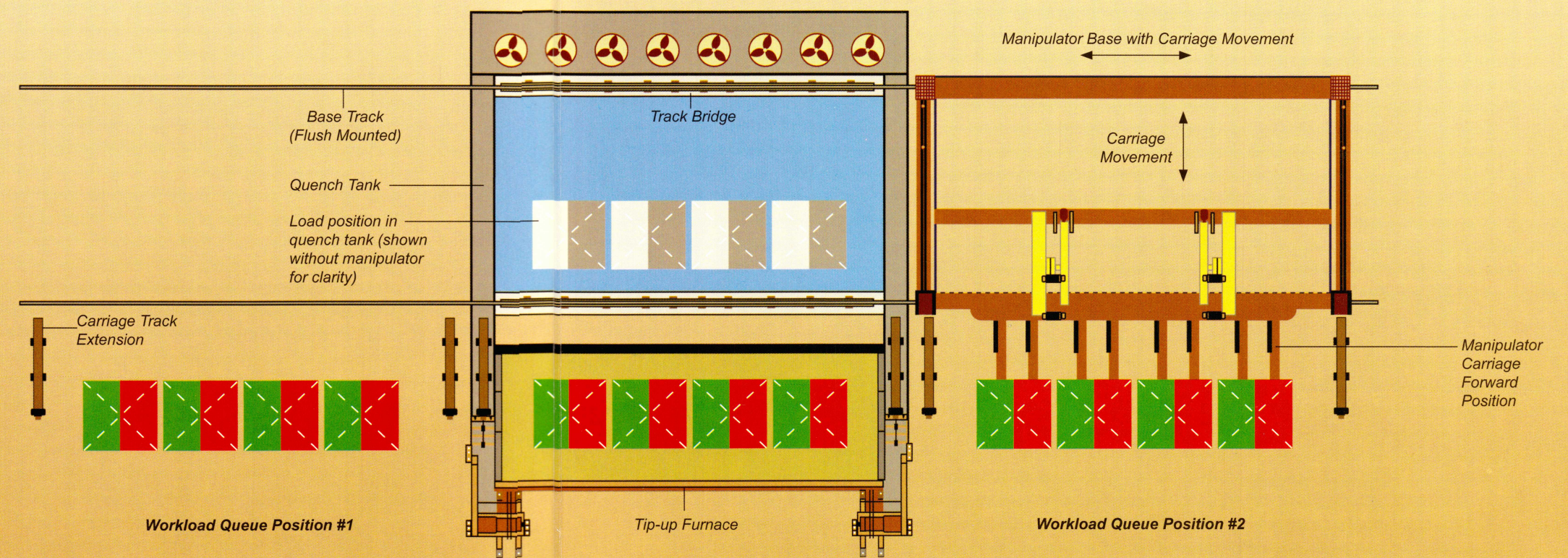
### 5: Manipulator

BeaverMatic Manipulators are specifically designed to transfer workloads in and out of BeaverMatic Tip-up Furnaces and through systems including load/unload tables and quench tanks. The carriage contains workload support forks that are raised and lowered by hydraulic cylinders. The base supports the carriage and workload as the Manipulator traverses between various pieces of equipment.

### 6: Quench Tank

For hardening applications, a Manipulator transfers a workload from the Tip-up Furnace to a BeaverMatic Quench Tank. The quench media is forced through a distribution system and the workload area by high velocity agitation. Immersion heaters and an air or water cooled heat exchanger maintains the quench media at the desired temperature and a centrifugal or cartridge filtration system removes contaminants.

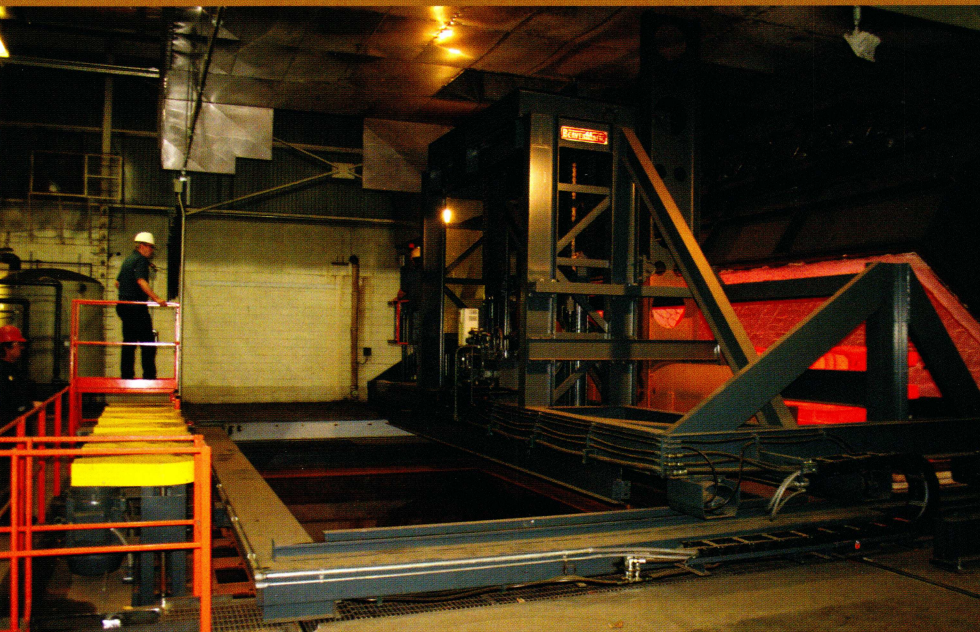
### Plan View



## BeaverMatic Tip-up Furnaces: Flexible machine designs and numerous process options.

BeaverMatic manufactures standard and custom batch and continuous equipment used world-wide in the commercial heat treating, aerospace, automotive, fastener, gear, tool, and energy generation industries. With 50 years of heat treating experience, we can help you improve your product.

This precision-engineered powerhouse, the BeaverMatic Tip-up Furnace, is highly reliable and efficient for processing heavy loads and for meeting high demand. A standalone furnace is ideal for carburizing, nitriding, nitrocarburizing, annealing, tempering or stress relieving. Systems consisting of a Tip-up Furnace, quench tank, and manipulator are capable of hardening.



**Systems** consisting of a Tip-up Furnace, quench tank, and manipulator are typically utilized for hardening.



A **standalone furnace** is ideal for these applications:

- carburizing
- nitriding
- nitrocarburizing
- annealing
- tempering
- stress relieving



# BeaverMatic

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