



The Global Leader in Thermal Technology

Walking Beam

Controlled Atmosphere Furnace

Built for Today. Ready for Tomorrow.

- **Nuclear Fuel Sintering**
- **Advanced Ceramics**



BTU's Walking Beam is a high temperature thermal processing system that provides continuous temperatures up to 1800°C under precisely controlled temperature and atmospheric conditions, in a full range of oxidizing and reducing atmospheres. Typical applications include high temperature metal and ceramic sintering, and uranium and gadolinium processing for power generation. The patented beam transport system is designed with high stacking capability for processing heavy loads. Product carriers are designed specifically to support individual stacks for greater thermal and payload efficiencies.

Walking Beam

The BTU Nuclear Fuel Walking Beam

BTU introduced the first walking beam into the nuclear fuel industry in the early 1970's and has since become the industry standard for high production sintering of nuclear fuel pellets worldwide. BTU offers customizable layouts, where overall heated length and ratio between the preheat length and high heat length are built to suit specific processes. The system is optimized for the specific needs of fuel production. Some highlights of this system include: high reliability, little or no hearth or product carrier wear, and very high production rate within limited floor space.



Options

- Gas mixer
- Optical pyrometer
- Sight ports
- Custom gas systems
- Mass flow controllers
- Custom control systems
- Monitoring thermocouples



The Global Leader

With dozens of units shipped and still in production, BTU is the world leader in high-volume furnaces for nuclear fuel sintering.



UO₂ Fuel Furnace - 12 Inch Standard

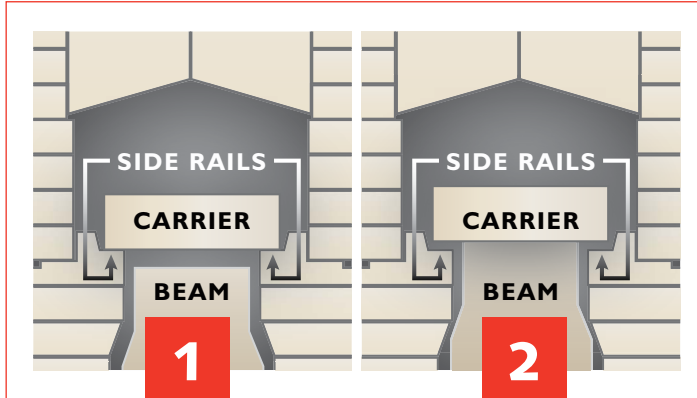
Number of Zones	Debinder (inches/cm)	Preheat (Inches/cm)	High heat (Inches/cm)	Production (Metric Tons)
9 Zone		4 zones / 148"/376 cm	5 zones / 215"/546 cm	700
8 Zone	3 zones / 92"/233 cm, 1 vestibule 24"/61 cm	2 zones / 60"/152 cm, 1 vestibule 30"/76 cm	3 zones / 106.5"/270 cm	400
7 Zone		3 zones / 93"/ 236 cm 1 vestibule 30"/76 cm	4 zones / 142" / 361 cm	550
6 Zone		2 zones / 62"/ 157 cm, 1 vestibule 30"/76 cm	4 zones / 106.5"/ 270 cm	400
5 Zone		2 zones / 62"/ 157 cm	3 zones / 106.5"/ 270 cm	400

The BTU Walking Beam Mechanism

The walking beam mechanism is used to advance the product through the furnace where heavy loads can be moved with near frictionless motion over long furnace lengths. The walking beam drive transport system is free of the traditional product carriers standard in a pusher type system.

The versatility of the drive transport allows for minimal length restrictions. The walking beam works in a 4 stroke cycle. Illustration 1 shows the product carriers supported on the side rails, while the beam rests below the base of the carrier. Illustration 2 shows the second cycle, the beam lifting the product carrier clear of the side rails. The third cycle advances the beam, with the

product carrier, towards the furnace exit, approximately 4 inches. In the fourth cycle, the beam lowers the product carrier back onto the side rails and retracts (moves backwards) toward the entrance of the furnace. The four cycles combine to advance the product about 4 inches at a time, with no friction between the product carrier and



the furnace components. The walking beam advances the product through the furnace in short strokes reducing thermal cycling on the beam ceramics.

The short strokes also ensure that loading and unloading are as reliable as the beam itself.

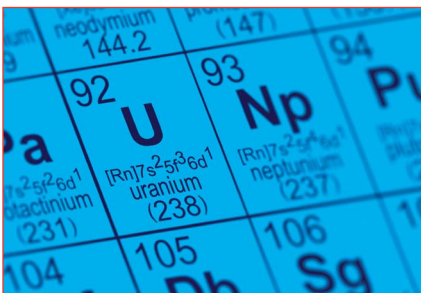
Loading and unloading is accomplished with the independent beam mechanisms by transporting the product carrier from the load table into and out of the furnace with one stroke. By using photo cells located outside the furnace and looking at the product carriers inside, the system knows when to load and unload. While loading and unloading, a flame curtain is used to insure the furnace

atmosphere is protected and outgas is safely ignited.

BTU has removed as many of the mechanical components from the furnace interior as possible, allowing better accessibility for maintenance.

Premium Components and Features

- **Cast Iron Doors** - Cast iron doors and backing plates are thick machine ground surfaces to prevent warping. Air cylinder operators and flame curtains are turned on only when doors are open.
- **Jump-out capability** - Each zone in the system has a number of heating elements in series. If one or two elements fail, the customer has the ability to simply jump out (by-pass) the elements and resume operation. This avoids downtime due to loss of a heating element.
- **Gas Systems** - Gas systems are assembled with top quality flowmeters, switches, valves and regulators. The gas system's panel operates on two preset flows, one for process gas, the second for purge gas. The preset flowmeters allows the furnace to switch from process gas to purge gas without a change in the pressure inside the furnace.
- **Gas Saturator** - The stainless steel heated gas saturator assembly with temperature control, water level control, auto refill, over-fill protection and automatic bypass is critical to the moisture content in the process chamber. The saturator delivers moisture to the system in a controlled way through heated stainless steel lines. Both to protect the bricks and in most cases enhancing the process.
- **Pressure Monitoring** - Furnace chamber pressure is monitored and observed at the gas panel. This information is used in the set up of the furnace and safety concerns are monitored.
- **Control System** - Furnace control is managed by up to date PLC controllers with Siemens S7 as BTU's basic offering. Customer specified manufactured units can also be accommodated. With all zone controls managed by the controller and automatic current limiting power controller, the furnaces are heated to temperature with preprogrammed heat up profiles. Power failures are managed by the controllers with a small uninterrupted power supply.



Global Strength

BTU provides world-class service and customer support in over 30 countries around the globe.



- ★ BTU Production and Engineering Facilities
- BTU Regional Locations
- BTU Representatives

- 24/7 Worldwide Customer Support
- Manufacturing and Engineering in the US and China
- Process Applications Laboratories in the US and China
- Multiple Global training locations

To contact BTU please go to www.btu.com/support-contact-sales.htm



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