



# FRP HEATING PANELS



# COAL AND MATERIAL HANDLING WINTERIZATION SYSTEMS

## FOREWORD

This brochure specifically addresses the freeze protection of coal handling systems within power plants. However, the problem is not unique to this material or type of plant, and the solution can be used with many other raw materials in many different types of processing facilities.

Please contact HTD Heat Trace, Inc to discuss how the FRP Heating Panel System may help you to eliminate your specific winterization problems.

---

## INTRODUCTION

Coal presents unique conveying problems as it passes from the mine mouth to the boiler. Its inherent moisture content, combined with the rain, snow and condensation encountered during shipping and storage, causes the coal to instantaneously bond and freeze to the metal surfaces of conveying and handling equipment during winter plant operation.



This instantaneous bonding process is known as **FLASH FREEZING**.

FLASH FREEZING can result in:

- Fuel starvation to the boiler and possible unit shutdown.
- Damage to bulk handling, transfer and storage equipment.
- Decreased unloading and conveying capabilities.
- Excessive labor costs and dangerous working conditions

Previously known as the Heat Tracing Division of Cooperheat, HTD Heat Trace, Inc. has addressed this specific problem with the development of a unique surface heating system that completely *eliminates flash freezing*.

---

## APPLICATION RESEARCH

The obvious answer to any freezing problem is heat, but HOW MUCH?..... and..... WHERE DO YOU APPLY IT?

HTD researched this specific application by simulating the exact conditions that exist at site. It was found that:

- Flash freezing can be prevented if the surface exposed to the moving or stored coal is maintained at or above 40° F.
  - Maintaining a steel temperature of 40°F in ambients as low as -20° F requires only moderate heat input (60 to 100 w/sq.ft)
  - There is no appreciable lateral conduction of heat across areas of steel that are not directly heated; therefore, successful freeze protection of problematic areas in a coal handling system (hoppers, transfer chutes, slide gates, etc) must involve the use of a full coverage heating system.
-

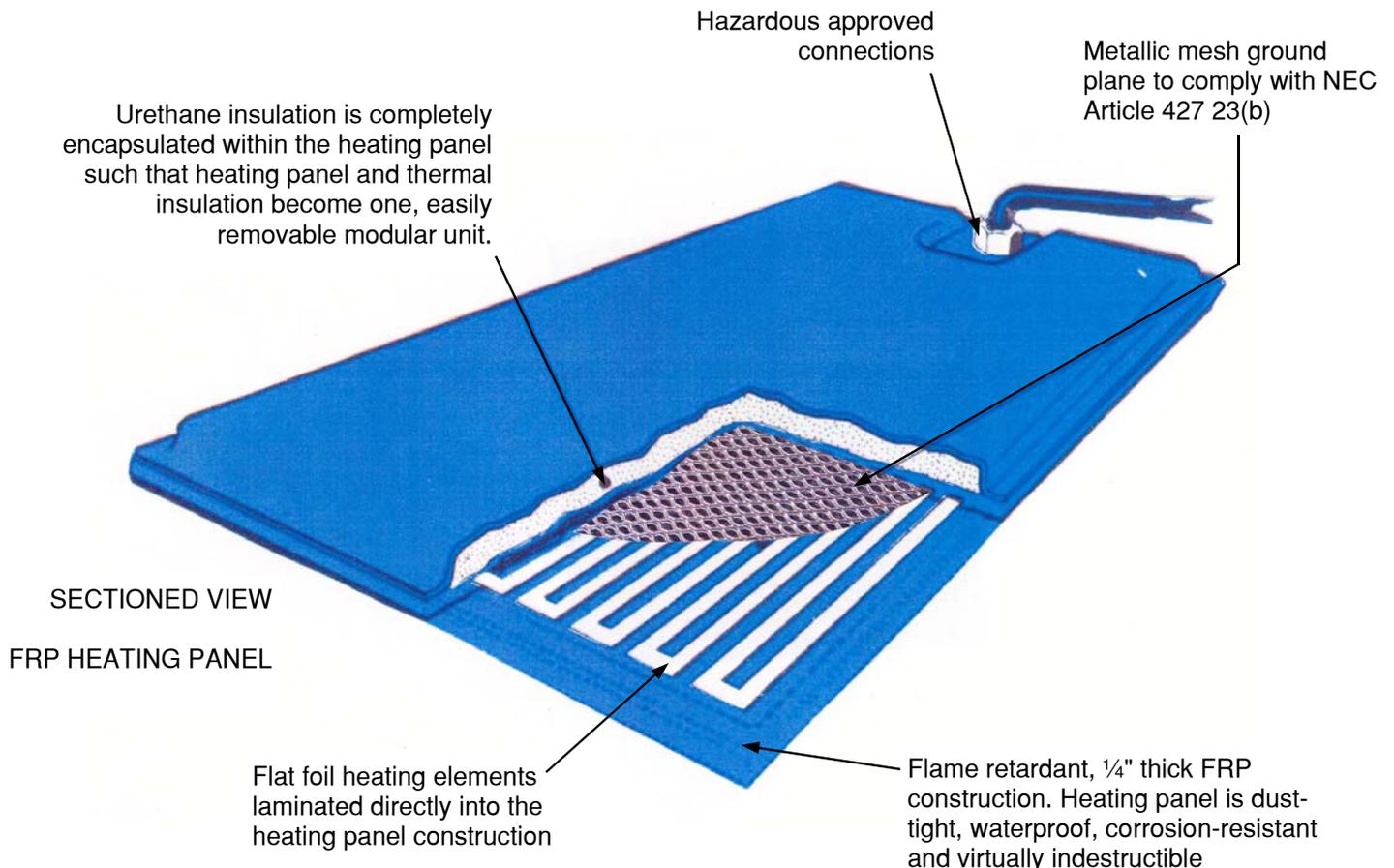
### PRODUCT DEVELOPMENT

Over and above the technical requirements, HTD also researched the actual field requirements by discussing the problem with numerous operators of coal handling systems. From this investigation the following requirements were established:

- The heater must be extremely robust, vibration proof, dust-tight and completely waterproof.
- The heater must be manufacturable in irregular shapes and sizes to fit the myriad of areas to be heated throughout the handling system.
- All electrical equipment, especially the actual heater, must be approved for use in hazardous areas as defined by the National Electric Code.
- The heater must be designed for simple installation, removal and quick re-installation due to the frequent maintenance attention required on most handling systems.
- Thermal insulation and heater must be built as one modular unit to minimize installation and removal costs.

From this information and research Cooperheat, now renamed as HTD Heat Trace, Inc. developed the **FRP Coal Handling Winterization System**.

### THE PRODUCT



## FRP HEATING PANEL FEATURES



### INSTALLATION EXAMPLE

MODULAR HEATING PANEL WITH BUILT IN THERMAL INSULATION CLIPPED DIRECTLY TO THE FACE OF A COAL TRANSFER CHUTE. EACH CLIP SWIVELS TO PERMIT IMMEDIATE REMOVAL OF THE HEATING PANEL.

To address the essential application and field requirements discussed earlier in this brochure, the FRP Heating Panel incorporates the following features:

- The FRP Heating Panel uses a low watt density, flat foil heating element to supply the exact power ratings needed to prevent flash freezing.
- Full coverage FRP Heating Panels can be manufactured in any shape or size and in flat or curved form to fit the exact area being heated.
- The FRP Heating Panel is also dust-tight, vibration-proof and completely waterproof. The laminated construction is extremely strong, corrosion-resistant, and does not burn or support combustion.
- FRP Heating Panels are Factory Mutual Approved for use in hazardous and unclassified (non hazardous) areas.
- FRP Heating Panels are lightweight, simple to install and equally as simple to remove and re-install.
- Every FRP Heating Panel is built as a modular unit, that incorporates its own thermal insulation encapsulated within the construction. This design allows plant personnel to remove and re-apply heaters and insulation at the same time such that emergency or routine maintenance can be performed on the coal handling system with minimum inconvenience and cost.

## THE SYSTEM



### FULL COVERAGE EXAMPLE

TRAPEZOIDAL HEATING PANELS ARE USED TO REACH INTO THE CORNERS ON EACH FACE OF THIS MAIN DISCHARGE HOPPER.

HTD offers a **"complete engineered system approach"** for all Coal Handling Winterization applications.

- Heating Panels are custom sized from your drawings or field measured to provide the essential **FULL COVERAGE HEATING SYSTEM**.
- Systems are designed for operation on standard plant voltages, no special transformers or electrical hook-ups are needed
- Each system is supplied with a Control Package that will automatically switch on the system based upon the prevailing climatic conditions at site.
- Engineering drawings, schematics and Operation and Maintenance Manuals are supplied with every system.

## APPROVALS



**M.S.H.A.**

FRP Heating Panels are M.S.H.A. Accepted and third party approved by FM (previously known as Factory Mutual) for the use in the following areas:

Unclassified areas  
Class I, Division 2, Groups C & D  
Class II, Divisions 1 & 2, Groups F & G  
Class III, Divisions 1 & 2



8 Bartles Corner Road, Unit # 104  
Flemington  
New Jersey 08822-5758  
USA

Tel (908) 788 5210  
Fax (908) 788 5204  
e-mail: sales@htdheattrace.com  
www.htdheattrace.com



# FRP HEATING PANELS

## CONTROLS AND ACCESSORIES



**FREEZE-PROTECTION OF  
HOPPERS, CHUTES AND TRANSFER POINTS  
WITHIN COAL, CEMENT, POWDER AND  
OTHER TYPES OF MATERIAL  
HANDLING / CONVEYING SYSTEMS**

# FRP HEATING PANELS

## SYSTEM ACCESSORIES

FRP Heating Panels are factory fabricated heaters that are fully tested and supplied ready for immediate installation. This unique heater is custom sized and shaped to fit the exact area being heated. The FRP Heating Panel is attached and held in position by mounting clips that are located around its perimeter. FRP Heating Panels are supplied complete with mounting clips, mounting studs, nuts and washers.

This mounting clip attachment system provides a simple and quick, low cost method of installation that also permits removal and re-installation of the heating panel when maintenance needs to be performed on the conveying equipment.

Photograph 1



FRP Heating Panel

Mounting clips to clamp the edges of the FRP Heating Panel directly to the area being heated.

FRP Heating Panels can be supplied with a conduit hub and custom length cold leads that may be routed to a local mounted junction box. Alternatively, FRP Heating Panels can be supplied with hazardous rated junction boxes molded directly onto the heating panel.

As shown in the Photograph 2, local mounted junction boxes provide a convenient method and location for connecting several heating panels to the specified power supply.

Photograph 2



Local mounted junction box to accommodate the connection of all of the heating panels installed on two sides of a hopper

Incoming power supply in rigid metal conduit

Flexible conduit covered cold leads from each heating panel to the local junction box

1/2 inch conduit hub built directly into the FRP Heating Panel to accept flexible conduit

## CONTROLS

**Photograph 3**

Type B 121  
ambient  
sensing  
thermostat



The FRP Heating Panel System is designed to maintain the inside surfaces of hoppers, transfer chutes and other parts of conveying systems above freezing during winter operation. Holding the inner surfaces above freezing will eliminate flash freezing of the frozen or wet coal as it moves through the conveying system. To ensure continuous protection, the heating system must be energized and operational at all times when the ambient air temperature falls below 40° F.

Control of this type of system is simple. The system is switched on and off by a thermostat that is set to monitor the rise and fall in ambient air temperature.

Photograph 3 shows the type B 121 ambient sensing thermostat. This is the standard thermostat used to energize FRP Heating Panel Systems in both hazardous and unclassified (non hazardous) areas.



**Photograph 4**

Type TXR 25 - 325°F  
over-temperature thermostat

All hazardous area applications also require the use of an over-temperature thermostat. This operational requirement is achieved with the use of a bulb and capillary style thermostat that senses the actual operating temperature of one of the FRP Heating Panels within the system.

Photograph 4 shows the TXR bulb and capillary style thermostat which has an adjustable range of 25-325°F. The sensing bulb of this thermostat fits into a phial pocket that is built into the heating panel selected to monitor over-temperature conditions.

**Photograph 5**



Indicator Panels are optional accessories available for use with the FRP Heating Panel System. This type of enclosure is normally mounted adjacent or near to the heating system to provide plant personnel with an immediate and continuous overview of the operating status of the heating system.

A "Power On" indicator light identifies that there is power available to the system. A "Power Required" indicator light identifies when the ambient thermostat is calling for power and the system should be energized and a "System On" indicator light confirms that the heating system is operational.

Photograph 5 shows a typical NEMA 4 Indicator Panel used in unclassified area installations (see next page for hazardous rated version). When required, this panel may also include contactors to switch the heating load, circuit breakers and alarms.

## FRP HEATING PANELS

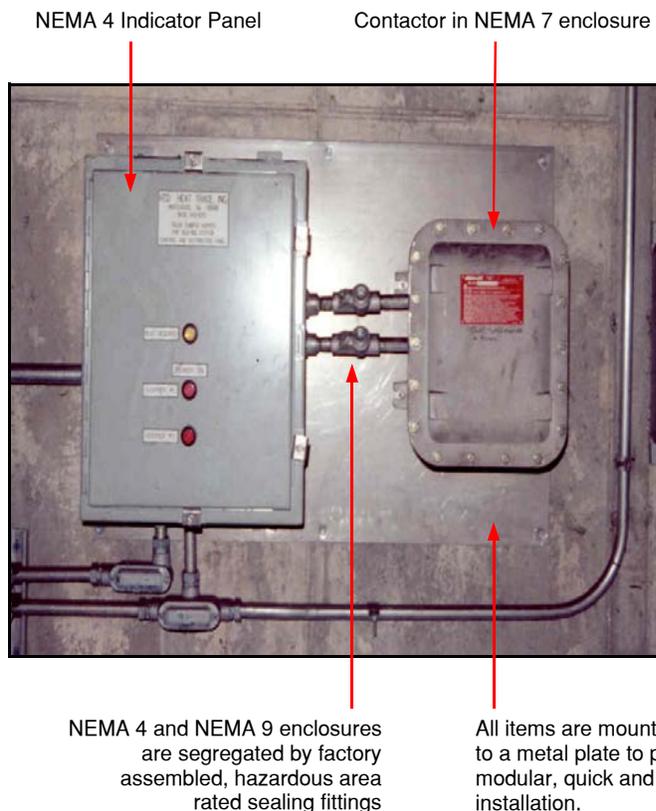
### CONTROLS (cont)

Hazardous area regulations require all *arcing and sparking devices* to be housed in a suitably rated explosion-proof and/or dust-ignition proof enclosure. These regulations apply to items such as thermostats and contactors.

The standard ambient sensing and over-temperature thermostats used with the FRP Heating Panel System are fully qualified for use in both hazardous and unclassified area installations. When the total size (amps) of the FRP Heating Panel System exceeds the switching capability of these thermostats, a contactor must be used to switch the total heating load.

To meet these system requirements in unclassified areas, the required contactor can be supplied as a separate item in a NEMA 4 enclosure or it can be included in the Indicator Panel that is shown in Photograph 5.

In hazardous area installations, the contactor can be supplied in a NEMA 9 enclosure as a separate item or, as shown in Photograph 6, it can be combined with an Indicator Panel into one modular, wall mounted package.



Photograph 6

This photograph shows a typical Indicator Panel and Contactor installed in a Class I Div 2 hazardous area application.

As required by the National Electric Code, the switching device (contactor) is sealed off from the non switching devices (Indicator Panel) by rigid conduit and sealing fittings.

All components are factory assembled, factory pre-wired and plate-mounted to form one modular easily installed unit.



8 Bartles Corner Road, Unit # 104  
Flemington  
New Jersey 08822-5758  
USA

Tel (908) 788 5210  
Fax (908) 788 5204  
e-mail: sales@htdheattrace.com  
www.htdheattrace.com



# FRP HEATING PANELS

## TYPICAL APPLICATIONS



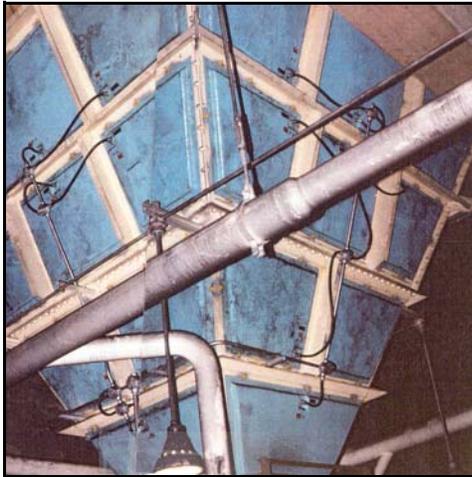
**FREEZE-PROTECTION OF  
HOPPERS, CHUTES AND TRANSFER POINTS  
WITHIN COAL, CEMENT, POWDER AND  
OTHER TYPES OF MATERIAL  
HANDLING / CONVEYING SYSTEMS**

## HOPPERS

Preventing flash-freezing in hoppers and silos is a common application for the FRP Heating Panel System. Typical installations are Rail Car Dumper Hoppers and Truck Dumper Hoppers in coal fired power plants, coal terminals and coal mines. The FRP Heating Panel System has also been successfully used to prevent material build up and freezing in wood chip hoppers in the Pulp and Paper Industry and to prevent freezing in cement, lime, ore, dust and powder hoppers in material bulk handling and general industrial plants

Following are a few examples of FRP Heating Panel System installations involving hoppers that are critical to plant operation and performance.

Photograph 1



FRP Heating Panels installed on a Rotary Car Dumper Hopper at the Port of Conneaut Dock facility of the Bessemer and Lake Eire Railroad Company in Conneaut, Ohio.

This bulk storage and transfer facility is located directly on Lake Eire approximately 68 miles east of Cleveland. The facility is designed to handle 25 million tons per year of metallurgical and steam coals, direct shipping ore, fine ores, concentrates, pellets, limestone and dolomite.

The two main Rotary Car Dumper hoppers handling all incoming coal shipments are freeze protected with FRP Heating Panels to prevent flash-freezing and hopper blockage during the long, harsh Lake Eire winter periods.

*This installation was originally commissioned in 1979 and upgraded in 2002 after 23 years of successful operation.*

Photograph 2



This photograph shows the FRP Heating Panel installations on the main Truck Dumper Hoppers at the Colver Power Project located in Cambria County, PA.

The Colver Power Project is a 102.5 MW waste bituminous coal fired power plant that has won several prestigious awards including the Power Magazine 1996 Powerplant Award, Power Engineering 1996 Project of the Year and the Environmental Protection Magazine 1998 Facility of the Year.

During the initial winter operations of 1995 / 96, this plant experienced significant flash-freezing problems as the fine, wet, bituminous coal was dumped from the delivery trucks into the only two hoppers that feed the plant. FRP Heating Panel Systems were designed and installed on each hopper in early 1996. *Since this time, winter operation of these critical hoppers has continued without any form of disruption from freezing or hopper blockage.*

## CHUTES

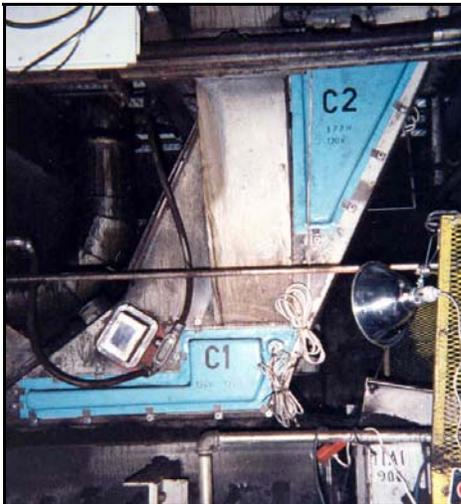
Photograph 3



Steel chutes are commonly used to direct the flow of coal and other bulk materials from one conveyor to another. During winter operations, the coal being conveyed may be wet, snow covered or frozen. As transfers from conveyor to conveyor take place, this wet or frozen coal is thrown into contact with the inner steel surfaces of the transfer chutes. If this steel is at or below 32°F, the moving coal may instantly stick or bond to the inside of the chute. This instantaneous sticking, bonding and build up process is known as *flash-freezing*. Continued coal flow and freezing accelerates the build up process until the transfer capabilities of the chute are reduced to the point that the conveyor must be shut down and the chute must be manually unblocked.

FRP Heating Panels, custom sized to fit *the critical impact faces* of the transfer chutes will maintain the inner steel surfaces above 32°F. As the coal leaves the conveyor and enters the chute, it now contacts a warm surface to which it cannot stick or freeze. Instead, the free flowing coal is able to slide and drop through the chute and the potential for build up and blockage within the chute is completely eliminated.

Photograph 4



The photographs show examples of how the FRP Heating Panel System has been successfully applied to prevent *flash-freezing* in various styles of conveyor transfer chutes.

Photograph 3. A 1979 full coverage installation on a Drop Chute

Photograph 4. Custom shaped "spot heaters" positioned to freeze protect specific problems areas at the base of an underground transfer chute.

Photograph 5



*This is just a small portion of the largest Coal Handling Winterization System in the world*, installed in 1985 on the Intermountain Power Project in Delta, Utah.

The photograph shows adjacent transfer chutes designed to provide alternating coal flow patterns to several conveyors.

FRP Heating Panels are positioned directly on the chute faces that carry the coal and they are sized to fit between liner bolts such that the chute liners can be removed and replaced without the need to disturb the heating system.

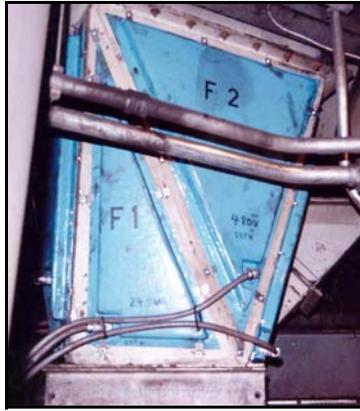
# FRP HEATING PANELS

## CHUTES (cont)

Photograph 7



Photograph 8



Photograph 7

Full coverage heating panels fitted to the sides and back faces of a sloping transfer chute.

Photograph 8

Triangular shaped FRP Heating Panels designed to fit a complex shaped transfer chute.

Photograph 9

Single heating panel located on the back impact face of a Drop Chute directly above conveyor.

Photograph 9



Photograph 10



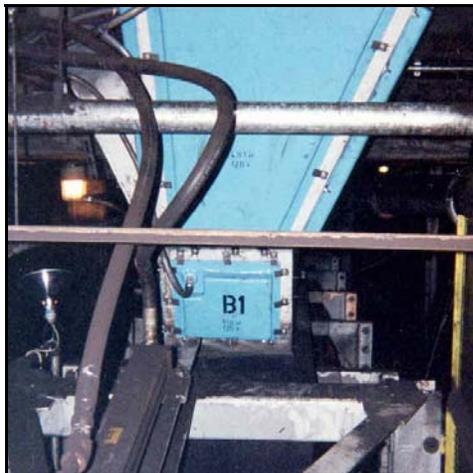
Photograph 10

Full coverage heating panel design to ensure that there is no freezing and blockage at this tapering entrance above a conveyor.

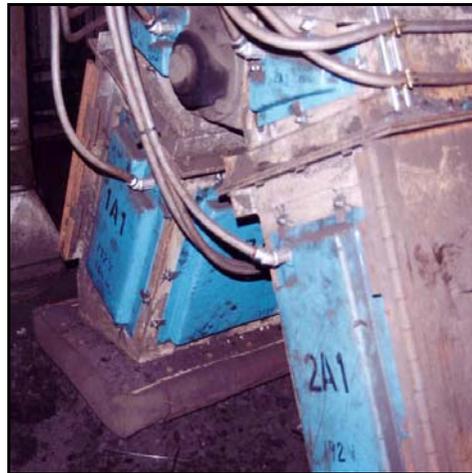
Photograph 11

Trapezoidal shaped heating panel on a pyramidal style feed chute.

Photograph 11



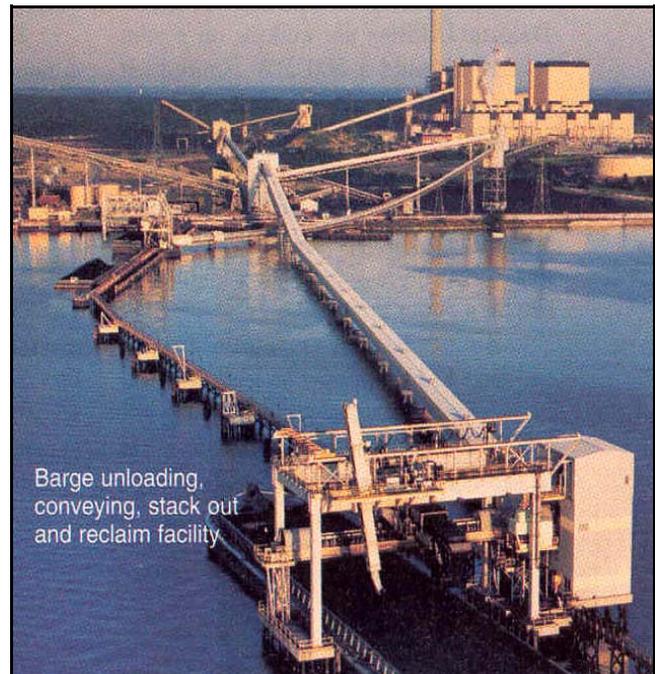
Photograph 12





# FRP HEATING PANELS

## CLIENT & PROJECT REFERENCES



## COAL AND MATERIAL HANDLING WINTERIZATION SYSTEMS

**INTRODUCTION**

The development and use of the FRP Heating Panel System was exclusively pioneered by the Heat Tracing Division of Cooperheat in 1976.

*Many of our original designs and installations are now over 25 years old, and winter after winter they continue to perform with complete reliability.*

In 1996, this Cooperheat division was incorporated as HTD Heat Trace, Inc.

The FRP Heat Panel System has been specified, installed and used successfully to prevent *flash freezing* in many Coal Fired Power and Industrial Plants throughout North America.

The system can also be successfully applied to applications in the Pulp & Paper, Mining, Cement and Bulk Material Handling industries.

Following is a partial list of clients and projects that have successfully used this unique system to eliminate material flow problems during winter operations.

| CLIENT                             | PROJECT   | APPLICATION / USAGE  |
|------------------------------------|---|--|
| A / C Power Company                | Colver Power Project<br>Cambria County, PA          | Truck Dumper Hoppers<br>C2 Chute<br>Transfer House Chutes      |
| American Colloid Corporation       | Upton Plant<br>Upton, WY                            | Replacement Feed Hoppers                                       |
| Atcon Corporation                  | Pontiac, MI   | Conveyor Feeds   |
| Barns and Tucker                   | Tanoma Mine   | Coal Chutes  |
| Beaumont Birch Co                  | Quantico, VA  | Transfer Chutes  |
| Bethlehem Mines Corporation        | Drennen, WV   | Chutes   |
| Bethlehem Steel Corporation        | Sparrows Point<br>Nr Baltimore, MD                  | C2,C3,M1 and M2 Hoppers<br>Breeze Chutes<br>Battery Flop Gates |
| Cincinnati Gas & Electric Co       | East Bend Station<br>Nr. Cincinnati, OH             | Hoppers  |
| Cleveland Electric Illuminating Co | Astubula Plant<br>Avon Lake Plant<br>Eastlake Plant | Coal Sled Hoppers<br>Drain Trays<br>Coal Dumper Hoppers        |
| Cooperative Power Association      | Coal Creek Station<br>Underwood, ND                 | Drop Chutes<br>Reclaim Hoppers                                 |
| Dayton Power & Light Co            | J. M. Stuart Station<br>Aberdeen, OH                | Belt Discharge Chutes<br>Chutes 7C & 8C                        |

CLIENT & PROJECT REFERENCES

FRP HEATING PANELS

| CLIENT                              | PROJECT  | APPLICATION / USAGE   |
|-------------------------------------|--|---|
| Detroit Edison Company              | Monroe Plant<br>Monroe, MI   | Breaker House Dust Collector  |
| Dravo Lime Co                       |  | Coal Bin  |
| E. I. Dupont Company                | Fayetteville Plant, NC<br>Washington Works, WV   | DISF Cryogenic Tanks  |
| Fairfield Engineering Co            | Caterpillar Tractor, Peoria, IL<br>E. I. Dupont Project 2613<br>J.M. Stuart St, Aberdeen, OH<br>Miller Brewing Company<br>Miller Brewing Company | Reclaim Hopper PMK - 1<br>Hopper<br>Discharge Chutes<br>Reclaim Hopper<br>Reclaim Hopper    |
| Flakt Incorporated                  | Grand River Dam Authority<br>GRDA # 1 & 2, Choteau, OK   | Spray Dryer Hoppers   |
| Freeman United Coal Mining Co       | Industry Mine  | Coal Hopper   |
| Illinois Power & Light Co           | Havana Station Unit # 6<br>Havana, IL  | Coal Reclaim Hopper   |
| Iowa Power & Light Co               | Council Bluffs Power Station<br>Council Bluffs, IA   | Coal Hoppers  |
| Kansas Power & Light Co             | Jeffrey Energy Center<br>St. Marys, KS   | Yard Hoppers  |
| Lake Eire Railroad Company          | P & C Dock<br>Conneaut, OH   | Dumper Hoppers  |
| Los Angeles Dept of Water and Power | Intermountain Power Project<br>Delta, UT   | Installed in 1985 / 86, this is the largest Coal Handling Winterization System in the world |
| Louisville Gas & Electric Co        | Mill Creek Station<br>Nr. Louisville, KY   | Transfer Chutes   |
| McNally Pittsburg Co                | Desorado Mine<br>Western Fuels, Bonanza Pwr Proj<br>Rangely, CO  | Coal Hopper<br>Chutes 2 & 12<br>Transfer Station Dribble Chutes<br>Surge Bin                |
| Monongahela Power Co                | Harrison Station<br>Haywood, WV  | Coal Lowering Well # 2  |

**CLIENT & PROJECT REFERENCES**

**FRP HEATING PANELS**

| CLIENT                           | PROJECT   | APPLICATION / USAGE                            |
|----------------------------------|---|--|
| Pennsylvania Electric Company    | Homer City Plant, Homer City, PA<br>Williamsburg St. Williamsburg, PA | Silos 1.2.3 & 4<br>Portable Coal Auger Sampler |
| Penntech Paper Inc               | Johnsonburg, PA   | Coal Feed Bin                                  |
| Pikesville Coal Company          | Chisholm Mine   | 500 Ton Bin and Feeder Chute                   |
| Piitsburgh & Conneaut Dock Co    | Port of Conneaut Terminal<br>Conneaut, OH                             | Rotary Car Dumper Hoppers                      |
| Reliant Energy                   | Seward Plant, New Florence, PA  | Head Chute 01HC1<br>Coal Chute to 03C1         |
| Sauer Industrial Contracting Inc | Homer City Plant<br>Homer City, PA                                    | Uncoaler                                       |
| Siemens Corporation              | Portland Generating Station<br>Portland, PA                           | Expansion Bottle Heaters                       |
| Stephens & Adamson Co            | Salt River Stacker  | Transfer Chutes                                |
| Tri-State G & T Association      | Craig Station 1 & 2<br>Craig, CO                                      | Chutes 3A / 3B                                 |
| Truesdale Company                |   | Bio - X Filter Heaters                         |
| Virginia Electric & Power Co     | Project 4602  | Coal Chutes                                    |
| Watkins Engineering Company      | IES Utilities Project   | Flop Gate Chutes                               |
| West Elk Coal Company            | Mount Gunnison Mine<br>Somerset, CO                                   | Chutes<br>Flop Gates and Slide Gates           |
| Wyodak Resources                 | Gillette, WY  | Discharge Chute                                |



8 Bartles Corner Road, Unit # 104  
Flemington  
New Jersey 08822-5758  
USA

Tel (908) 788 5210  
Fax (908) 788 5204  
e-mail: sales@htdheattrace.com  
www.htdheattrace.com