

# HOTFOIL-EHS

***FREEZE PROTECTION FOR COAL HANDLING SYSTEMS***



## *FM Approvals*

Class I, Division 2, Groups B, C, D

Class II, Divisions 1 & 2, Groups F, G

Class III, Divisions 1 & 2

Ordinary Areas



**PROBLEM:**

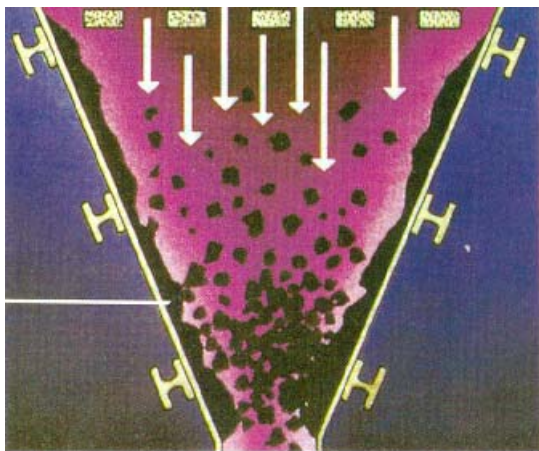
Conveying coal from stockpile to boiler during winter months is a well-documented nightmare for plant operators. Identical conveying problems exist within the mining industry as coal is moved around the mine site.

Coal stored outdoors on the stockpile or delivered by unit train or barges picks up moisture from rain and snow. When this wet or frozen coal is conveyed, it inevitably comes into contact with the plate steel of the various hoppers and chutes within the coal handling system. During winter, this plate steel is below freezing for extended periods.

When wet or frozen coal encounters steel at sub freezing temperatures an instantaneous bond is formed. This bond causes immediate and often catastrophic blockage of the hopper and chutes. The bond and resultant blockage are so severe that often pneumatic drilling equipment and explosives are required to free up the system.

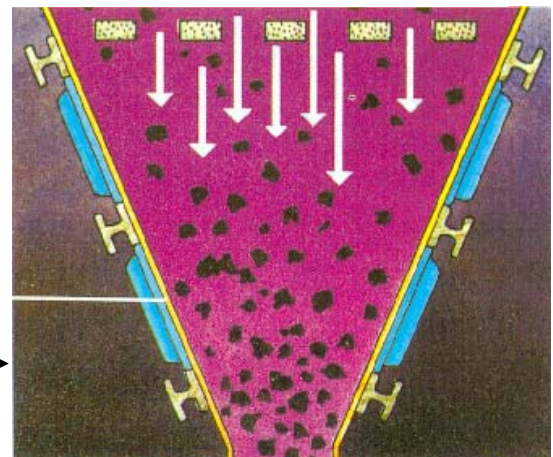
This problem, known as **FLASH FREEZING**, is extremely inconvenient and very costly. Several cases are documented where utility and industrial boilers have been shut down due to blocked conveying systems.

The Hotfoil FRP heating panels system specifically address the flash freezing problem.



← CROSS SECTION OF UNHEATED HOPPER

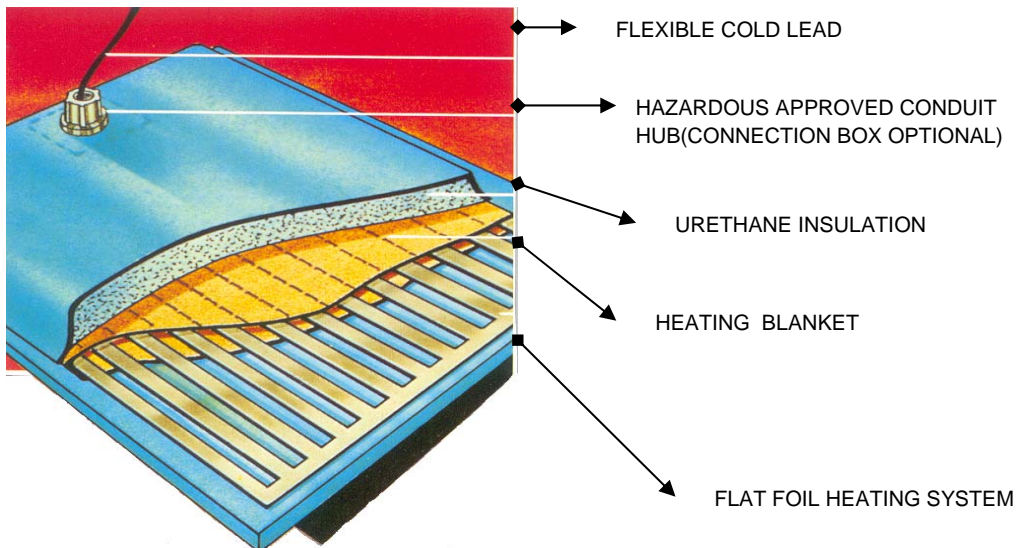
Plate steel is at ambient, sub freezing temperature causing flash freezing and hopper blockage.



CROSS SECTION OF HEATED HOPPER USING HOTFOIL FRP PANELS →

Plate steel is at 40°F eliminating potential for flash freezing and hopper blockage.

**Cross Section Showing FRP Construction**



ENGINEERING AND DESIGN

Interested in getting an idea of a cost on an FRP Heating System?

WE OFFER: Complete system design FREE OF CHARGE without a Purchase Order.

- We are capable of designing the systems from drawings or site sketches, once the system has been designed it will be sent to you with a formal quote, should you choose to purchase we will re-issue the Drawings for Approval.
- If drawings are not available will drive/fly to your site for a visit, once there we will measure and design the heating system directly on the Hopper, Chute, Flopgate, Etc... We will return to the office design the system on CAD and offer you a formal quote. If we design the system from the field we will take 100% responsibility if for some reason a panel / panels don't fit.
- As with all of our Heating Systems we offer a wide range of controls, from your basic thermostat to Electronic Controllers. We try to keep everything simple so that you pay for only what you need and nothing more.
- And last but not least we are available 24 hours a day 7 days a week, no exceptions.

The drawing you see below is the design that was originally put together for the picture you see on the front.

**HEATING SYSTEM SPECIFICATIONS**

HEATER TYPE.....FRP HEATERS  
 HEATER LOAD.....6,535 WATTS  
 HEATER AREA.....98.25 SQ. FT.  
 HEATER WATT DENSITY.....67 WATTS/SQ.FT.

TOTAL ELECTRICAL LOAD.....6,535 WATTS  
 VOLTAGE SUPPLY.....480V, 3PH, 60HZ, 3-WIRE.

**BILL OF MATERIALS**

ITEM	QTY:	DESCRIPTION
1	1	SET OF FRP HEATERS: 26 HEATERS IN TOTAL, 6,535 WATTS DN 480 VOLTS.
2	1	THERMOSTAT E55-L: "AMBIENT" 0-150 DEGF., 1-S.P.D.T. 15 AMP SWITCH, WITH A 6' CAPILLARY AND BULB ASSEMBLY, NEMA 4X
3	1	THERMOSTAT E55-M: "HIGH-LIMIT" 50-300 DEGF., 1-S.P.D.T. 15 AMP SWITCH, WITH A 6' CAPILLARY AND BULB ASSEMBLY, NEMA 4X
4	2	JUNCTION BOXES: NEMA 4X, STAINLESS STEEL WITH GE. TERMINAL BLOCKS, 30A, 600 VOLT RATED.
5	220	MOUNTING CLIPS TYPE 'Z'

**HEATING SYSTEM DETAILS FOR THE FLDOP GATE**

REF.	QTY	SIZE	WATTS	VOLTS	DHMS
FGHB-A1	1	43 x 6	105	143	197
FGHB-A2	1	SEE DRAWING	291	480	792
FGHB-A3	1	SEE DRAWING	306	480	752
FGHB-A4	1	SEE DRAWING	179	240	324
FGHB-A5	1	45 x 15	341	480	676
FGHB-A6	1	26 x 17 x 15	251	248	245
FGHB-A7	1	37 x 17	308	480	748
FGHB-A8	1	34.5 x 23.5 x 17	235	232	229
FGHB-A9	1	61 x 55 x 11	314	480	734
FGHB-A10	1	56 x 50 x 8.5	202	267	353
FGHB-B1	1	48 x 15	336	480	686
FGHB-B2	1	48 x 15	336	480	686
FGHB-B3	1	48 x 15	336	480	686
FGHB-B4	1	23 x 15	161	213	282
FGHB-B5	1	23 x 15	161	213	282
FGHB-B6	1	48 x 7	141	193	262
FGHB-C1	1	43 x 6	105	143	197
FGHB-C2	1	SEE DRAWING	291	480	792
FGHB-C3	1	SEE DRAWING	306	480	752
FGHB-C4	1	SEE DRAWING	179	240	324
FGHB-C5	1	45 x 15	341	480	676
FGHB-C6	1	26 x 17 x 15	251	248	245
FGHB-C7	1	37 x 17	308	480	748
FGHB-C8	1	34.5 x 23.5 x 17	235	232	229
FGHB-C9	1	61 x 55 x 11	314	480	734
FGHB-C10	1	56 x 50 x 8.5	202	267	353

**SCHEMATIC DIAGRAM**

480V, 3PH, 60HZ, 3-WIRE

PHASE	LOADS	TOTAL
L1	FGHB-A5, FGH-B-A7, FGH-B-A8, FGH-B-A10, FGH-B-A2, FGH-B-A3, FGH-B-A9, FGH-B-C5, FGH-B-C7, FGH-B-C2, FGH-B-C3, FGH-B-C9	L1-L2 2170 WATTS
L2	FGHB-A6, FGH-B-A8, FGH-B-A10, FGH-B-B5, FGH-B-A4, FGH-B-C4, FGH-B-C10, FGH-B-B4, FGH-B-C1, FGH-B-C6	L2-L3 2192 WATTS
L3	FGHB-A1, FGH-B-A1, FGH-B-B1, FGH-B-B2, FGH-B-B3, FGH-B-B6, FGH-B-C8, FGH-B-C10	L3-L1 2173 WATTS
<b>TOTAL 6,535 WATTS</b>		

**GENERAL NOTES:**

- HEATER RESISTANCE TOLERANCE IS +/- 10%
- FRP HEATER COLD LEADS ARE 10FT. #16 AWG WIRE, C.S.P. INSULATED & OVER JACKETED AND EXIT THRU A 3/4 INCH NPT HUB.
- SYMBOL "O" DENOTES APPROX. LOCATION OF CONDUIT HUBS.
- ALL SURFACES TO BE HEATED MUST BE CLEANED AND GROUND SMOOTH BY INSTALLATION CONTRACTOR BEFORE INSTALLATION OF HEATING PANELS.
- ALL FIELD WIRING BY OTHERS
- FDR INSTALLATION INSTRUCTIONS REFER TO HOTFOIL INC. "INSTALLATION, OPERATION & MAINTENANCE MANUAL".
- IT IS THE RESPONSIBILITY OF THE CLIENT/USER TO ENSURE THAT THE HEATER INSTALLATION IS IN COMPLIANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL ELECTRICAL CODES AND REGULATIONS.
- CAUTION: DO NOT WELD, FLAME CUT OR GRIND NEAR THE INSTALLED HEATERS - REMOVE THE HEATERS FIRST.
- FRP HEATING PANELS ARE SUPPLIED WITH TWO INCH THICK THERMAL INSULATION, UNLESS OTHERWISE NOTED.
- AMBIENT T'STAT, "CTS" TO BE SET TO 50 DEGF.
- OVER-RIDE T'STAT, "HTS" TO BE SET TO 150 DEGF.
- THE FOLLOWING PANELS SHALL BE SUPPLIED WITH A PHIAL POCKET TO INSERT OVER-RIDE T'STAT ("HTS"): FGH-B-B2 & B3
- HOTFOIL DESIGN BASED ON SITE-VISIT.

REV.	DESCRIPTION	DR.	DATE
1	REVISED FOR FINALS	MJR	9-10-04

DATE	BY	TITLE
040811E	MJR	DESIGN

**hotfoil** Electric Heat Treating

FRP PANEL HEATING SYSTEM LAYOUT & DETAILS

REV. 1 OF 2

## **SYSTEM DESIGN:**

When the problem of flash freezing was originally investigated, it was found that the simple application of strip and rod type electrical heaters was not the answer.

Several hoppers and chutes were instrumented to measure the distribution of heat throughout the plate steel. This research overwhelmingly proved that there was little to no lateral heat transfer from the heat source. In simple terms, the plate area covered by a heater was adequately freeze protected. The plating not covered by a heater was not freeze protected. For this reason, the Hotfoil-EHS system design involves **FULL HEATER COVERAGE**. All available plate area of hoppers and chutes are covered with custom built FRP heating panels. The power rating of each heating panel is approximately 80watts per square foot, a value that was empirically established to maintain 40°F inside plate temperature in -20°F ambient conditions (applicable for all mild steel plate up to 1 1/4" thickness).

Hotfoil engineering staff has designed many such systems both large and small. Our package will involve heater layout, installation equipment and instructions, electrical schematics and temperature control equipment. All applications are handled on a project management basis to ensure customer and end user satisfaction.

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## **PRODUCT/SYSTEM FEATURES**

### ***Custom Designed System***

Each client gets the assurance that the specific problem in question is being addressed with a product designed for the job.

### ***Factory Mutual Approved/MSHA Accepted***

The product and system are approved for use in hazardous, wet and dust laden atmospheres. Safety and reliability is unquestionable.

### ***Insulated Heating Panels***

This feature can save thousands of dollars through the elimination of on-site thermal insulation requirements.

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