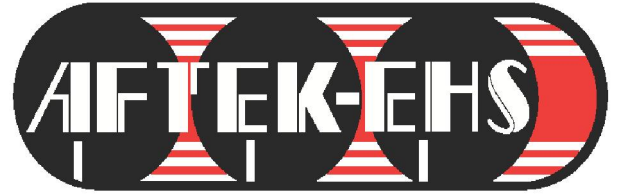


HOTFOIL-EHS



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



APPROVED

PROBLEM:

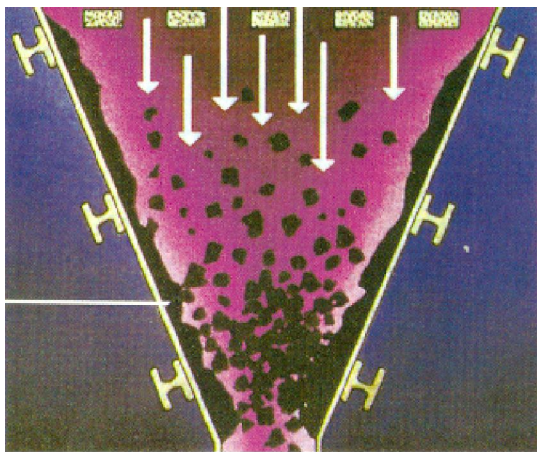
Conveying coal from stockpile to boiler during winter months is a well-documented nightmare for plant operators. Identical conveying problems exist within the mining industry as coal is moved around the mine site.

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.

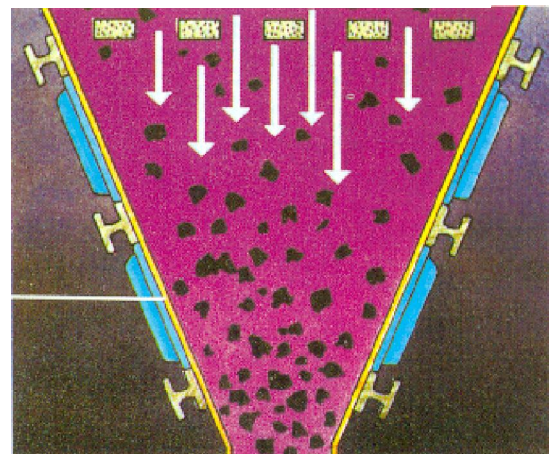
When wet or frozen coal encounters steel at sub freezing temperatures an instantaneous bond is formed. This bond causes immediate and often catastrophic blockage of the hopper and chutes. The bond and resultant blockage are so severe that often pneumatic drilling equipment and explosives are required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

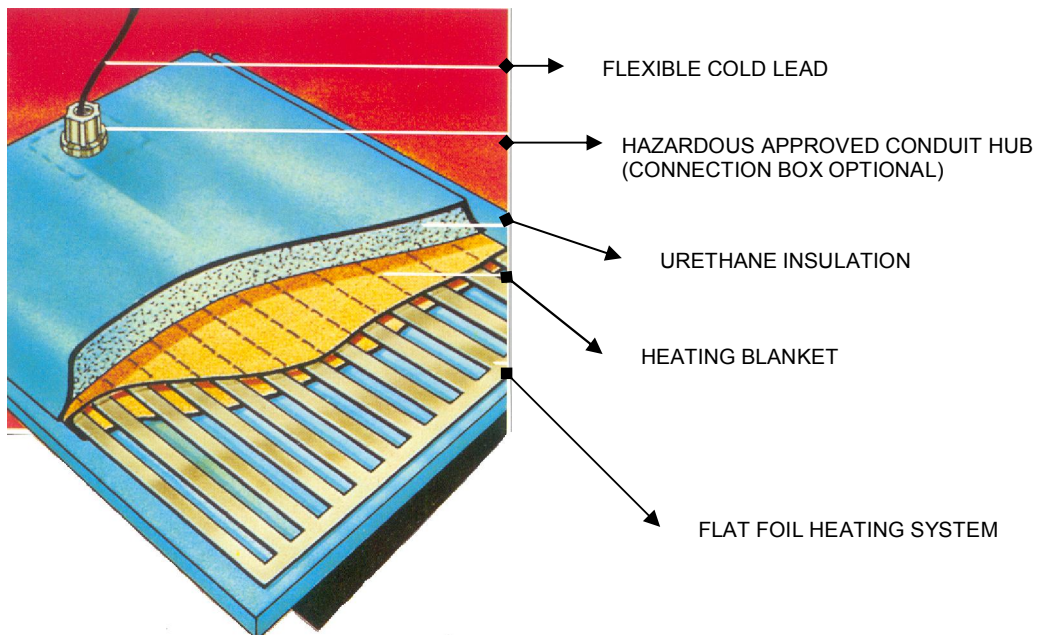


← CROSS SECTION OF UNHEATED HOPPER
Plate steel is at ambient, sub freezing temperature causing flash freezing and hopper blockage.



→ 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



SOLUTION:

Hotfoil type FRP heating panels are unique in concept and design.

The basic heat source within each panel is a heating blanket comprising of a flat foil heating system, sewn into high quality woven glass cloth. The flat foil heating system ensures even and efficient distribution of heat. The electrical circuitry design is such that the foil elements are connected in multiple parallel paths for ultra reliability.

The finished heating blanket is embedded and totally encapsulated in a ¼” thick lamination of fiberglass reinforced plastic (FRP). This lamination process provides a completely weather, hose and dustproof heating panel with unrivaled mechanical and electrical strength. The majority of FRP Heating Panels supplied also incorporate a layer of urethane insulation as an integral part of the unit. This feature completely eliminates the need for further insulation after the heater has been installed. Non insulated FRP heating panels can also be supplied for installation under client supplied thermal insulation.

Electrical termination of each FRP heating panel is achieved by use of a hazardous approved conduit hub or connection box. These devices are molded directly into the heating panels and require no installation by the end user.

The Hotfoil FRP Panels are Factory Mutual Approved for Class I Division 2 – Groups C & D, Class II Divisions 1 & 2 – Groups F & G, Class III Divisions 1 & 2 – hazardous areas.



← COAL SILO HEATED WITH FRP HEATING PANELS AT A MAJOR UTILITY IN THE NORTH EAST, USA

▶ SAMPLING CHUTE, 12" DIAMETER, HEATED WITH FRP HEATING PANELS



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 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.

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.

Full Coverage Design

Satisfactory performance guaranteed even in the harshest of winter climates.

Simple Installation

Reduces installation costs, no special skills or tools required.

Low Watt Density

Minimal electrical consumption and running costs.

Hotfoil manufactured FRP heating panels have been reviewed by the M.S.H.A. (Mines Safety Health Association) and accepted for use in the coal mining environment and industry.

HOTFOIL-EHS

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