Hadek Protective Systems

Company profile

- A specialist for internal linings of flue gas ducts and chimneys in fossil fired power stations
- World wide distributor of the PENNGUARD® Block Lining System, providing a range of technical services, throughout the power industry
PENNGUARD® Block Lining System

Advantages

- **Chemical resistance**
  A Pennguard® lining is suitable for a wide range of fuels (coal, oil, petcoke, lignite, biofuels) and operating conditions – from low-temperature wet flue gas to high temperature untreated flue gas, even with a high SO$_3$ content

- **Temperature resistance**
  The lining will perform in operating temperatures up to 392°F – and even higher temperatures for short periods
PENNGUARD® Block Lining System

Advantages

- Thermal shock and cycling resistance: extreme thermal cycles in modern power plants challenge. Most thermal shocks have no effect on Pennguard® linings.
- Low weight: A Pennguard® lining weighs just 2.5 – 3 lbs / sqft, it does not require anchors, and is very suitable for seismic regions.
PENNGUARD® Block Lining System

Advantages

- Long service life
  Pennguard® linings installed with Hadek’s supervision are highly resilient and durable. Many Pennguard® lining installations are still in use after 30 years, with almost no maintenance or repair

Long term Performance

- Field experience since early 1980’s
- Expected service life: more than 30 years
- Very low maintenance requirement
  (< 0.1% per year)
PENNGUARD® Block Lining System

Protecting against fires

- An FGD plant fire could destroy your outlet ductwork and chimney
- FM Approvals tests show that Pennguard® linings protect substrates in case of fire
- At temps of over 932°F, alloy-clad substrates are at risk of collapse, and FRP will likely catch fire, even with fire retardants
- In 1996, an FGD fire at one US power station caused 1,832°F temperatures inside a steel chimney. The Pennguard® lining successfully protected the chimney from collapse
PENNGUARD® Block Lining System in New Steel Chimney Flues

- A method of constructing and lining new steel chimney flues
PENNGUARD® Block Lining System in New Steel Chimney Flues

- Height: 650 ft
- Two new chimneys
- 21 ft diameter Unit 1, 27.5 ft diameter Unit 2
- Total surface area 87,535 ft²
PENNGUARD® Block Lining System in Steel Chimney Flues (Retrofit)

- 550 ft. concrete chimney
- Two steel flues for unit #2 & #3
- Total surface area unit #3 flue 29,449 ft²
- Installation Time: 4 weeks including liquid collection system and steel substrate repairs
PENNGUARD® Block Lining System in Brick Chimney Flues

A new Pennguard® lining can save your stack from the aggressive conditions caused by FGD
PENNGUARD® Block Lining System in Brick Chimney Flues

Annular Space Condition Prior to Pennguard lining

- Large acid deposits in annular space
- Deteriorated Steel Bands
- Acid deposits on foundation
**PENNGUARD® Block Lining System in Brick Chimney Flues**

- Pennguard® Lining will be completely isolating the brick from flue gas and condensate, protecting the liner bands and chimney foundation
- Insulating it from thermal shocks in case of by-pass
- No liner bands replacement anymore
Hadek’s New Chimney Design
- A revolutionary new type of chimney that consists of a reinforced concrete shell with a Pennguard® lining applied directly to its concrete surface
- Makes internal flues obsolete
- Faster and less expensive to build
- Virtually no maintenance
PENNGUARD® Block Lining System in Flue Gas Ducts

- FGD Outlet ducts lined 87,535 ft²
- Lower 167 ft of brick chimney flue
- Non-insulated ducts
PENNGUARD® Block Lining System in Flue Gas Ducts

Mechanical protection of Pennguard® lining on floor with Tufchem® acid resistant concrete
Project Services offered to PENNGUARD® Customers

- Hadek Technical Services