

Project Report

HADEK**PROTECTING POWER
PLANT CHIMNEYS**

Patnow Power Station

Key facts about Patnow Power Station

- 4 x 200 MW lignite fired units
- Two wet limestone FGD systems
- No flue gas reheat
- Each FGD absorber is connected to a Pennguard® lined concrete chimney (New Chimney Design)

Large power station in Poland saves money, time and space by using the New Chimney Design for two new FGD wet stacks.

The Patnow-Adamow-Konin power station complex in central Poland has a combined capacity of 2,457 MW. Together, the three power stations have a 10 % share in total Polish electricity production. To meet new Polish and European environmental standards, four existing lignite fired units at the Patnow power station are being retrofitted with Flue Gas Desulfurization (FGD) plants.

Each of these units has a 200 MW capacity. After a careful economic evaluation of all alternatives, Patnow power station ordered Rafako, a leading EPC contractor to the Polish power industry, to construct two wet limestone FGD plants, each with sufficient capacity for two of the 200 MW units.

The owner also decided, that he would not reheat the desulfurized flue gas before emission. The two existing chimneys were not suitable for wet stack operation, so it was necessary to build new chimneys, either as a single, twin flue chimney or as two separate chimneys. For all design alternatives, the required height was 489 ft.

Rafako and specialized chimney constructor Karrena studied a number of alternatives and found, that two, Pennguard® lined concrete chimneys (New Chimney Design) would be



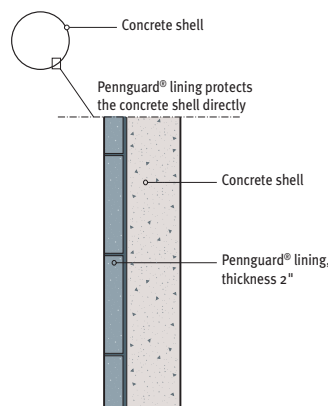
the optimum approach for the Patnow site. Even though two chimneys seemed more expensive than one, the cost of each chimney could be kept low, by applying the Pennguard® lining directly to a slender 27.6 ft diameter concrete shell, avoiding separate flues. Each of these chimneys could be close to its own FGD absorber, minimizing the use of expensive ductwork.

The selected option of two Pennguard® lined concrete chimneys also offered some further advantages. First of all, two slender chimneys use far less space than one large diameter chimney with extensive ductwork. Furthermore, the slipforming of the two concrete shells could be done quickly, with minimal interference in the construction process of the FGD itself.

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PENNGUARD® Block Lining System

A fast and economical construction process



1. The two chimneys were constructed using continuous slipforming technology. The slipforming of each 489 ft high concrete shell took 38 days.
2. As the slipform slowly moves upward, a team of two plasterers 'float' the fresh concrete on the inside of the chimney shell, creating a smooth surface.
3. Immediately following this surface treatment, a special epoxy primer is rolled onto the concrete. This primer will slow the evaporation of water from the curing concrete and it also offers a suitable bonding layer for the Pennguard® lining.
4. After completion of the chimney shell the Pennguard® Block Lining System is installed directly onto the primer coated concrete. The lightweight, 2" thick lining is installed from the flue gas inlet level up to the top.

5. The Pennguard® installation work is performed by a team of 6-8 brick layers, using a movable work platform with a full floor and a fast lift for transportation of personnel and materials. Good lighting of the work area is essential.



6. When the major installation work of the Pennguard® lining has been completed, the chimney is equipped with a false floor, placed just below the flue gas entry level. When completed, this floor will also be protected using a Pennguard® lining and an additional layer of Tufchem® silicate concrete.



How two chimneys can be cheaper than one

The decision by Patnow power station, to build two concrete, Pennguard® lined chimneys, using the New Chimney Design, was based on several considerations.

1. Less space

The use of two slender chimneys and short FGD outlet ducts, rather than a twin flue chimney and much longer ducts, saves a lot of space on the site. Shortening the flue gas ducts also minimizes pressure losses and thereby reduces required fan power.

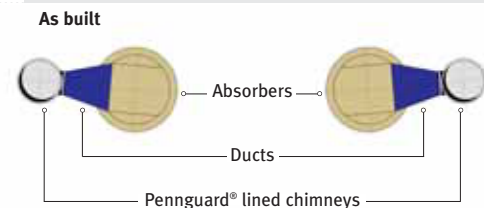
2. Less time

The short construction time of each chimney is a welcome advantage when planning a complex FGD construction job.

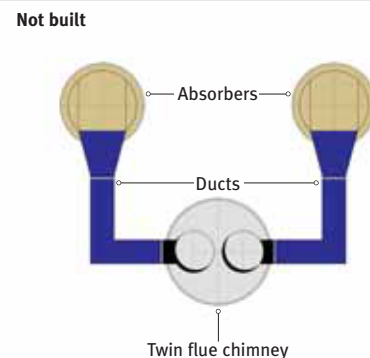
3. Lower cost

With all of these advantages, the two concrete Pennguard® lined chimneys cost less, not more than a single twin flue chimney. The total amount of concrete used for two chimneys was 3,453 yd³. A single twin flue chimney would have required 4,251 yd³ of concrete. It would also have required two internal flues with a combined surface area of 64,734 ft².

Looking at the chimneys alone, using two concrete Pennguard® lined chimneys, instead of a single twin flue chimney, offered an estimated savings of 10 % on total chimney construction cost. On top of this, an estimated 164 ft length of ductwork was also eliminated.



Using two, Pennguard® lined concrete chimneys minimizes the space requirement and keeps the FGD outlet ducts short.



A twin flue chimney is more expensive, uses more space and requires much longer FGD outlet ducts.