PROJECT INFORMATION

Janamanjung 4 and Janamanjung 5 power stations, Malaysia

Picture 1: Janamanjung 4 (back) and Janamanjung 5 (front) power stations, Malaysia (Picture courtesy of Ferbeck Industrial Chimneys)

Key Facts for both projects

Location	:	Manjung, Perak, Malaysia
Customer	:	Tenaga Nasional Berhad
EPC contractor:	:	Alstom / CMC (Janamanjung 4) /
		Sumitomo / Daelim (Janamanjung 5)
Chimney Builder	:	Ferbeck Industrial Chimneys (for both projects)
Fuel type	:	Coal
MW	:	1 x 1.000 MW (for each project)
Flue gas treatment	:	Sea water FGD
Flue gas properties	:	82 - 92°C desulphurized reheated flue gas
Chimney	:	200 m reinforced concrete chimney with one
		Pennguard™ lined steel flue
Surface area lined	:	4.459 m2 (Janamanjung 4)
		4.396 m2 (Janamanjung 5)

Two ultra supercritical coal fired power stations in Malaysia use concrete chimneys with Pennguard lined steel flues

Janamanjung 4 and 5 are two, 1.000 MW coal fired power stations owned by Tenaga Nasional Berhad (TNB). State owned TNB is the largest electricity producer of Malaysia, supplying up to one third of the country's power by 2018. Both plants are located within TNB Janamanjung's 325 hectare power complex in Manjung, Perak (see picture 1).

Janamanjung 4 is already in operation since April 2015 and was constructed by EPC Contractor Alstom, France and its consortium partner China National Machinery Import and Export Corporation. Janamanjung 5 is now under construction by a consortium of Sumitomo Corporation and Daelim Industrial Corporation.

When Janamanjung 5 is in operation also, the total generating capacity of the power complex will be 4.100 MW. This will contribute to continued stability of the Malaysian power grid.

Both plants are equipped with sea water FGD to reduce SO_2 emissions to less than 200 mg/Nm^3 which is significantly lower than the current World Bank standard of 500 mg/Nm^3. Following desulphurization in the FGD plant, the flue gas is reheated to a temperature of 82 - 92°C in gas-to-gas reheaters and emitted through a reinforced concrete chimney with one Pennguard lined steel flue.

Except for the visual appearance and some details, the 200 m high chimneys of Janamanjung 4 and 5 are identical and built by Ferbeck Industrial Chimneys from France. The inside surface of both carbon steel flues are lined with the Pennguard Block Lining System to protect it against the highly corrosive operating conditions.

Pennguard linings installed in two different ways

For both projects, carbon steel sections were first grit blasted and primer coated on a remote site. All sections were then transported to the power plant site and connected to each other as pre-fabricated cans (4,5 m high x 8,38 m diameter for Janamanjung 4, and 8,5 m diameter for Janamanjung 5).

At **Janamanjung 4** each can was transported into the chimney, connected to the erected steel flue and lifted one meter up from the ground. Then the Pennguard lining was installed onto the steel substrate from a scaffold (see pictures 2 and 3).

Picture 2: Steel can ready for positioning into the chimney

Picture 3: Pennguard application from a scaffold on ground level in the erected flue

At **Janamanjung 5** the steel cans were first all attached to each other as a completely erected vertical steel flue. Then the Pennguard lining was installed from an aluminum suspended work platform (pictures 4 and 5).

Picture 4: Pennguard lining installation

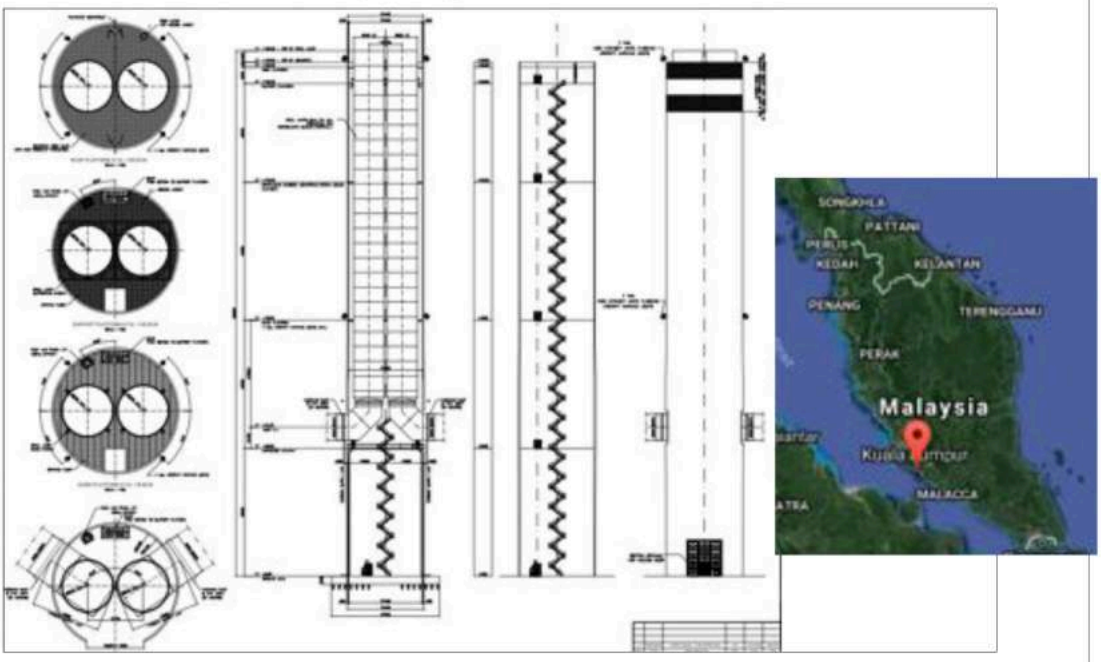
Picture 5: Pennguard lining completed in the vertical part of the steel flue

The two steel flues combined, required a total of 8.855 m² of Pennguard linings.

PROJECT INFORMATION

Jimah East Power Station, Malaysia

TNB decides to use Pennguard lined chimney flues for its latest project, a 2 x 1000 MW coal fired power plant at Jimah



Drawing: Jimah East Power Station, Malaysia
(Drawing courtesy of Ferbeck Industrial Chimneys)

Key Facts

Location	:	Negeri Sembilan, Malaysia
Customer	:	Tenaga Nasional Berhad
EPC contractor:	:	Consortium of Toshiba, IHI Corp., Hyundai Engineering Co. Ltd, Hyundai Engineering & Construction Co. Ltd
Chimney Builder	:	Ferbeck Industrial Chimneys
Fuel type	:	Coal
MW	:	2 x 1.000 MW
Flue gas treatment	:	Sea water FGD
Flue gas properties	:	90°C desulphurized reheated flue gas
Chimney	:	160 m reinforced concrete chimney with two Pennguard™ lined steel flues
Surface area lined	:	7.060 m2

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