



## **HANOI CERAMIC TILES**

### **Use of Waste Hot Air from the Rapid and Final Cooling in the Vertical Drier**

#### **SUMMARY OF THE OPTION**

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Hanoi Ceramic Tiles is the first manufacturer of high quality wall tiles and floor tiles in Vietnam. The company has three tunnel kilns, and the kiln 1 was chosen as the audit focus area because it was consuming the most diesel oil (DO) compared to the other two. Moreover, nearly 50% of the cooling air (at an average temperature of 185°C) is vented to the atmosphere in order to enable slight positive pressures in the kiln and prevent in-leakage of cold stray air. This wasted hot air could be used in vertical dryer to replace about 136 tons DO per year which equivalent to 36,700 US \$/year. This option required an investment of US\$ 21,500, operating cost of US \$ 8,179 and brought the payback time of nine months. Annual GHG emission reduction is 344 tons of CO<sub>2</sub>.

#### **KEY WORDS**

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Ceramics, Vietnam, Waste heat recover, Kiln, Vertical dryer

#### **OBSERVATIONS**

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Freshly pressed tiles must be dried before glazing in the kiln. The vertical dryer used for this purpose has a heat duty of around 500,000 kcal/hr, which was originally supplied by the combustion of DO. On the other hand, excess cooling air is introduced in the kiln in order to enable slight positive pressures and prevent penetration of outside cold air. In total, 10,364 kg/hr of air are used in the kiln for rapid and final cooling, of which 50% (or 5,182 kg/hr) are vented in the atmosphere. The vented cooling air has a temperature of 185°C, corresponding to an equivalent heat content of 117,007 kcal/hr. This air could be used in the vertical dryer and reduce the quantity of DO necessary for its operation.

#### **OPTIONS**

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Wasted hot air from rapid cooling and final cooling of Kiln-1 is recovered in the mixing tank and introduced into the vertical dryer 1. Due to the loss of pressure in pipelines, an additional fan has been installed in order to ensure a sufficient air flow.

To maintain the pressure in the kiln, the installation of two dampers was recommended. One was put on the hot air pipeline between the mixing tank and the kiln. The other one was put on the kiln stack. When the former is closed, the latter must be opened and vice versa. Moreover, the air distribution valves of the vertical kiln must be adjusted in order to ensure the correct drying of the tiles at all times.

#### **RESULTS**

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The implementation of this measure resulted in the reduction of existing DO consumption in vertical dryer 1 by 136 tons DO per year. This corresponds to savings of US\$ 36,700 (around 578 million VND) per year at the local commercial rates, as shown in Table 1. The investment involving additional ducting, a booster fan (a centrifugal fan with output capacity of 18 kwh and speed of 1,500 rpm) and civil works amounted to US\$ 21,500 (around 339 million VND). Due to installation of an additional fan, this option required extra electricity consumption of 155,520



kWh per annum which costs US\$ 9,642. The new system has a simple payback period of nine months. The project is technically successful and the system operates reliably and effectively.

#### **Financial benefits**

- Investment: US\$ 21,500
- Annual operating cost: US\$ 368
- Annual cost savings: US\$ 9,642
- Payback period: 10 months

#### **Environmental benefits**

- Annual DO savings: 136 tons
- Annual GHG emissions reduction:  $(136 \times 3.19) - (155,520 \times 0.00068) = 328$  tons CO<sub>2</sub>
- Emission factor: 3.19 tons CO<sub>2</sub>/ton of DO 0.00068 tons CO<sub>2</sub>/kWh

### **FOR MORE INFORMATION**

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