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Applicationbrief

Eclipse Product: AH-MA Series Air Heat Burner

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Application: High Capacity Direct Gas Fired Make-Up Air Heating System

Description:

JSC "Kachkanar Iron Ore Mining and Dressing Concern, Vanady" is situated on the northwest side of Sverdlovsk region about 350 km from Ekaterinburg. The company mines and dresses iron-ore enriched by vanadium producing an iron ore balled concentrate.

Climate is:
- contrast continental;
- the duration of a heating season is 5200 hours (216 days)
- average design ambient temperature in the heating season is –7° C
- minimum design temperature –36° C.

One of the workshops at JSC "Vanady", the Average and Small Fraction Crushing Building, is 216 m x 51 m with a maximum height of 60 m. The crushing process in the building is very dusty. Therefore, a powerful filtered exhaust system is used to clean the inside air. To compensate for the exhaust and to supply warm fresh air, a makeup air system is used. It's design productivity is 1,000,000 m^3/hr of air provided by 6 blowers. In fact only 5 blowers are in operation producing 600,000 to 700,000 m^3/hr.

Building heat is supplied by hot water coming from a boiler house that is owned by another company. The length of the hot water pipeline is about 1 km. Due to the dilapidated condition of the pipes and boilers the water temperature, as supplied, is too low for proper heating. At low ambient air temperatures there is a risk of freezing the heat exchangers and consequently destroying the entire heating system. Maintenance personnel have to turn the makeup air system to recirculation while the exhausting system continues to work. In that case, ventilation flow rate goes down and the quantity of heat comming to the building decreases as well.

This results in the following:
- infiltration and cold air draughts through openings, doors, etc. due to imbalance between the makeup air and exhaust systems;
- high concentrations of dust and deteriorating air quality that is harmful to personnel, equipment and controls;
- frequent iron ore freezing in bunkers due to negative inside temperatures which result in long downtimes during mechanical cleaning of the bunkers;
- icicles form on building elements and beams gradually destroying them.

The heat supplied, though inadaquate, was essential and very expensive.

By changing from hot water to natural gas firing the customer expected to:
- resolve the above problems;
- minimize downtimes;
- reduce heating expenses;
- increase intervals between equipment overhauls.

The central ventilation system supplies air into the building through a general air duct to a vertical shaft. Cross section of the duct is 5 by 7 m. The six blowers placed on three floors draw air in from the shaft. Air is heated up by heat exchangers installed on the suction side of the each blower.

The solution was to install an AH-MA v. 2.00 air heat burner with a capacity of 11.7 MW to the lower part of the air duct. The burner consists of 10 cross sections and 58 linear (300 mm) sections. Because real flow rate of the makeup air system is half the design flow rate, the upper part of the duct is closed by metal sheets. For the sake of reliability the burner is divided onto two independent sections with separate ignition and temperature control. A gas valve train and a control panel were installed under the burner on a special platform. The gas valve train consists of two equal parts supplying the fuel to their own sections. Fuel for the heating system is natural gas with net calorific value of 35.6 MJ/m^3 at a pressure of 3 bar. The old hot water system was not removed and saved as a standby system.

A separate controller modulates gas flow on each section to provide a given air temperature downstream of the burner. Each blower has its own temperature sensor, which controls air temperature at a blower outlet. Temperature readings are transferred to the central control panel for supervision and to turn off the blower in case of a dangerous decrease in temperature. Gas analyzers control CO and NOx concentration in air downstream of the burner and record readings, time and date with one week between document printing.

The direct gas-fired makeup air heating system was started up on December 1999. At that time, the temperature was –28º C. The makeup system was set to preheat the ambient air and supply it into the building with no recirculation.

That resulted in the following benefits:

- danger of heat exchanger freezing was excluded;
- due to proper balance between in-coming and exhausting air flow rate, cold air infiltration and draughts were negated;
- icicles on building elements and beams disappeared;
- iron ore freezing in bunkers no longer takes place;
- heating cost savings were achieved;
- additional fuel savings due to temperature control and possibility to produce heat in strong accordance with heat demands;
- quantity of staff catarrhal sickness was dramatically reduced.

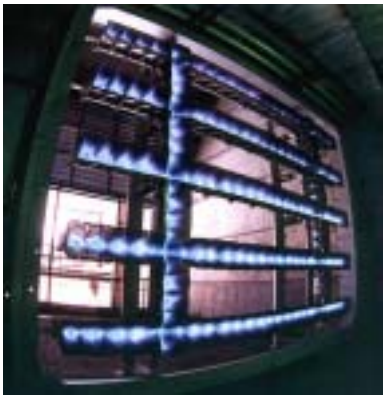
Statement of the customers

Mr. Belousov G. L., chief engineering manager of JSC “Kachkanar Iron Ore Mining and Dressing Concern, Vanady”:

“…This unique installation capacity of 12 MW heats up the whole Average and Small Fraction crushing building. Except additional heat the system allowed to improve a technology. At temperature +20 ^{0}C in winter time which have not ever been early we increased productivity in the Building. Although the system is not cheap but payback time is evaluated as 3-4 months…”

Mr. Popov A.V., deputy chief power manager of JSC “Vanady”:

“…System start up was made at ambient temperature –28 ^{0}C. If before system starting at zero level everywhere ice has laid on the floor then after twelve hours burner firing ice melts, local microclimate is improved. All attendant stuff working there responds to increasing temperatures, essential decreasing of dust in air and getting better labor conditions at whole...”



AH-MA Burner In Operation

Valve Train

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Litho in U.S.A.