More PLANT PROBLEMS

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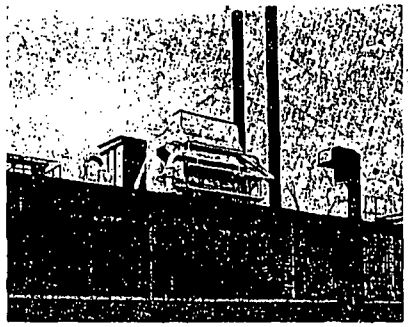
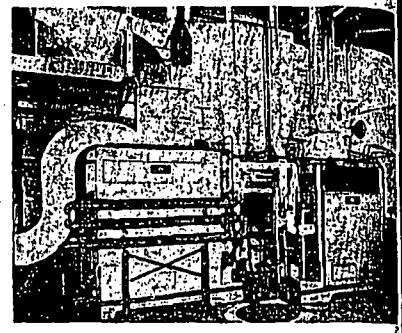


EVAPORATIVE aftercooler mounts on the roof, does good job



ABSORBENT liquid in this drier takes moisture out of a

More Answers to Problem No. 2 from August 1952

INSTRUMENT-AIR DRYING is a critical problem today because so much production and manufacturing depends on pneumatically controlled devices. These instruments must perform right every minute of the year. Moisture that may cause freeze-ups, rusting or poor operation of instruments must be removed.

Either refrigeration or adsorption drying can be used for instrument air. But refrigeration has definite economic limitations besides needing some care for operation and maintenance.

Air, when leaving a refrigerated cooler, has less moisture than when entering, and its temperature is lower. Unless reheated, it is 100% saturated. If it passes through areas at a lower temperature, some moisture will condense in the air lines. Cooling air to a 40-F dewpoint isn't too difficult but below this the capacity needed rises sharply.

Adsorption drying reduces dewpoint of air without changing its temperature. At all times the air is far from a saturated condition and no reheat is needed. Positive protection against condensation of moisture at different temperature extremes is assured.

Highly saturated air leaving a refrigerated cooler can corrode and scale interior of compressed-air lines even though there is no condensation. Scale may flake off and be carried to the instruments. With adsorption drying the air is at such a low relative humidity corrosion doesn't occur.

Adsorption dryers have fewer moving parts, need less maintenance. For continuous service a dual installation is used. Operation may be made fully automatic if you desire it.

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Pittsburgh Lectrodryer Corp, Pittsburgh, Pa.

TWO OTHER METHODS of removing moisture from atmospheric air are: (1) drying air with a liquid absorbent—a continuous process (2) evaporative cooling in apparatus especially designed for compressed-air or gas aftercooling. Method 2 is preferable for compressed air used in tools and instruments.

Evaporative aftercooler, photo above, left, in discharge line between compressor and receiver does a good job. High-temperature air passes through a cooling coil in a watertight casing through which a blower forces outside air. Water is sprayed continuously over the coil, cooling the compressed air by evaporation of moisture.

In this setup the compressed air is always cooled to within a few degrees of the atmospheric wet-bulb temperature. This is lower than the dry-bulb temperature of the atmosphere. No additional cooling takes place in the air lines, nor is there any further condensation.

In winter, automatic control of amount of air entering spray chamber prevents freezing. Control element also activates a heating element, when necessary.

Experience with a large number of installations shows this method of moisture removal has low first cost. Only maintenance needed is the cleaning of the cooler surfaces at regular intervals.

Photo, above right, shows a typical unit using a moisture-absorbent liquid. It removes moisture from air as a separate function from cooling or heating, gives precise control at all times. This is classified under type 1, above.

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MOST MOISTURE causing trouble in instruments can be removed with a pipe-line-type separator installed in compressor discharge line ahead of receiver.

Assuming intake air is saturated at 70 F, it contains 1.2 lb of water per 1000 cu ft. Compressing this air to 175 psi and cooling to 70 F in the aftercooler reduces moisture content to 0.085 lb per 1000 cu ft. This is only 7% of the incoming moisture.

As average aftercoolers reduce leaving air temperature to within 12 to 15 F of entering water temperature, cooling shown above can be accomplished with water at 55-58 F. About 2 gpm of water is needed.

Cooling air to 40 F only reduces moisture to 0.025 lb per 1000 cu ft. Slight additional moisture removal isn't usually warranted and may be quite expensive if it involves using refrigeration.

Dual-adsorption units cost four to five times as much as an aftercooler. With an aftercooler you can remove 93% of the moisture from the air with low first cost, and low installation and maintenance costs. Efficiency is good.

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