DEHUMIDIFICATION

Dehumidification was defined as the removal of moisture vapor from the air to decrease the dew point temperature.

The objective of dehumidification is to reduce the rate of corrosion to minimal level by reducing the moisture content of the air to a safe level, 50% or less, at the prevailing temperature. A flow of air through the working area always is required and it is this air that must be dehumidified. The amount of moisture vapor can be reduced by refrigeration.

Using refrigeration to remove moisture vapor from the air is a common and economical method of dehumidification.

Ambient air is circulated over a system of refrigeration coils. The surface temperature of these coils is set at a temperature considerably lower than that of the dew point of the incoming ambient air. The air chills, reaches saturation, and condensation occurs.

This condensation is collected and pumped out of the system. The air exits the cooling coil section of the dehumidifier at a reduced temperature, but more important, with low dew point and humidity. Low temperature air than can adjusted simply by adding (dry) heat to the air stream based on the particular application requirements.

AIR-COOLED DEHUMIDIFIER

Principles of Operation

Air-cooled refrigerated type dehumidifier performs dehumidification by separating moisture from outside air through condensation. The air discharged is therefore low in temperature and absolute humidity.

The machine incorporates a compressor, condenser, evaporator, blower, heater, condenser fans and a control unit all housed within a container.

Refrigerant R-22 is compressed by the compressor and fed to the condenser coil. As the condenser coil is cooled by the condenser fan, the refrigerant is liquefied. Liquid the refrigerant is then fed to the evaporator coil via expansion valves. In passing through the expansion valve the refrigerant drops in pressure and absorbs heat from the evaporator coil and gasified into vapour again. The vapour return back to the compressor to be compressed and the process repeats itself.

AIR-COOLED DEHUMIDIFIER

Introduction

Rate of corrosion or formation of iron oxide on a newly blasted steel plate is directly proportional to the rate of moisture condensing on its surface. Such condensation takes place when the surface temperature of steel plate is within 3 deg. C from dew point of the given climate.

Dew point is the temperature at which condensation of moisture in the air starts. Given normal ambient of 23 deg.C and relative humidity or RH of 90%, dew point reading from a psychometric chart is 30.5 deg.C. An afloat tank where radiant heat from the sunlight is less, couple with external sea water acting as a cooling media, could easily meet this dew point and traps condensate. This explains why blasted surface inside a tank oxidizes faster than openly blasted steel surface.

By keeping the tank RH below 45% at a room temperature of 27 deg.C, dew point is lowered to 13 deg.C. Under such condition, a newly blasted surface can be kept away from microscopic oxidation due to condensation for as long as 2 weeks before coating is applied.

Such a process of lowering the RH in an enclosed blasting environment using a dehumidifier is widely practiced today. It cost no more than 4% of the total cost of corrosion control. In return, it allows blasting process to continue day and night without having to apply holding primer. The overall cost is lowered as the completion time is shortened. Further, coating quality is improved since there is no overlapping of new and old paint film.

Besides controlling RH in a tank, dehumidifier also serve the following purposes;

- Promote solvent evaporation from the paint film to ensure proper curing.
- As a means of ventilation to lower-down solvent concentration within a tank to prevent explosion.
- Improve comfort level thus improving working efficiency.
- Prevent corrosion due to contact of steel plate with human sweat shortening time of water drying after hydrojetting.

DESICCANTS

Desiccants are substances that naturally have a high affinity for water, so high they can draw moisture directly from the surrounding environment. Desiccants absorb moisture until they are saturated then they must be regenerated by a heated air stream or by a chemical process.

Most desiccants are solid in their normal state, though there are some liquid desiccants, such as common sulfuric acid (used in the chemical manufacturing industry), lithium chloride, or polymeric materials, such as triethylene glycol. These liquid materials are called absorbent dessicants.

Most desiccants in solid form are called adsorbent desiccants. Moisture is adsorbed onto the surface of a granular material, such as silica gel, which is capable of holding large quantities of moisture. These materials also can be dried easily and removed and recycled for further use.

For the coating industry the rotating-bed silica gel adsorbent dehumidifiers are most prevalent. The solid desiccant is put into a large rotating drum or wheel (10 to 12 revolutions per hour) that contains structured air contact media in the form of honey comb.