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## **HUMIDITY CONTROL FOR SAP EXTRACTION**

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The reclaim of cellulose fluff pulp fiber and super absorbent polymer (SAP/SAM/AGM) from hygienic products has become an important economic factor for the producers of these items. Initially, the industry accepted the reclaim in mixed form where the fiber and SAP were uniformly distributed throughout the "mix". As quality control increased and the value of the SAP increased, a need to extract the majority of the SAP granules from the "mix" was created. Several firms have developed methods for SAP extraction but not without complications.

The process involving the extraction of SAP granules from a fluff pulp & SAP mix has been proven to be very sensitive to temperature and humidity. Of these two variables, humidity has the greatest effect on the process. There are two sources of humidity in this type of process. First, you have humidity in the ambient air in the area where the process is located. Second, there may be humidity/moisture in the fluff pulp & SAP mixture. Both of these sources must be considered when controlling the relative humidity or moisture. It seems that the SAP extraction process is most efficient when operated in an environment with temperatures in the 20/68 to 35/95 degrees (C/F) range with relative humidity in the 40% to 55% range. The balance of temperature and relative humidity is somewhat of a "sliding scale" but humidity is the key factor for this process.

Having set the desired range for temperature and relative humidity, there are other considerations regarding the process. There is "Zone Dehumidification" and "Point Dehumidification" involved in this SAP extraction process. "Zone" refers to the area where the SAP extractor and SAP purifier/aspirator are located. This area must be isolated in a room or plenum with an effective vapor barrier. If the room is not vapor resistant, humid air will quickly infiltrate this space. "Point" refers to a specific area that will receive additional dehumidification. In this case, the fluff & SAP mix that is discharged from the "Fluff Condenser". A vertical reserve/metering feeder (V/R) is an excellent humidity control point. The V/R should have a tall reserve section to allow sufficient "dwell time" for the fluff & SAP mix. This is accomplished by drawing dry air through the fluff & SAP mix in the reserve chamber. This will provide pre-conditioning for the "mix" prior to the SAP extraction process. The V/R also provides surge control, pre-opening and pre-metering allowing the SAP extractor(s) to operate more efficiently.

There are two basic methods of controlling the humidity in the SAP extraction process. Both examples are based on typical weather patterns for middle Georgia (USA) and a process room with a volume of 8,000 cubic feet (227 cubic meters). The following sections will give a quick overview of each technology.



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## **MECHANICAL REFRIGERATION DEHUMIDIFIER:**

In principle, this is very similar to residential/commercial/industrial air conditioning with a few exceptions. The main exception being the DX coil design. This coil is much more efficient in removing moisture than a commercial HVAC unit. As the moist air passes over the coils, the moisture in the air condenses on the coils. This condensate is drained off and the warm refrigerant gas inside the finned coils is sent to a remote air cooled condenser unit where the heat is rejected and the refrigerant is changed to a liquid to complete the cycle. A room thermostat and humidistat will control the system to the appropriate set point. This technology is available as a standard, "off-the-shelf" solution from several suppliers and is often used in industrial applications requiring this type of medium range of humidity control.

## **DESICCANT WHEEL DEHUMIDIFIER:**

This technology uses a material that is capable of rapidly absorbing moisture from an air stream and then rapidly releasing this moisture. A wheel or disk is "loaded" with this desiccant material and installed in a split air stream. The disk is rotated in the primary or process air stream where moisture is absorbed from the process air. The disk continues to rotate and enters the reaction or secondary air stream where hot air removes the moisture and exhausts the hot, moist air to the outside. The "recharged" disk now enters the process air stream again to complete the cycle. A room thermostat and humidistat will control the system to the appropriate set point. This type of equipment is available from several manufacturers as standard, packaged modules. Desiccant dehumidifiers are used for medium to low humidity applications.

Both systems are available in standard packages for approximately \$ 25,000.00 (USD). This is a typical price for the room volume and local weather conditions mentioned earlier. There are many sizes, capacities and variations available. In addition to the actual equipment price, you will need to consider shipping, installation and start-up expenses. Normally, these are low to moderate. A more costly and important expense will be involved with the isolation of the SAP extraction equipment and the vapor barrier construction. Each individual installation must be evaluated to determine the actual requirements before more detailed technical and pricing information can be generated.

For additional information, please contact Ibis International, Inc..