



HVAC Evaporative Pads with Chitosan

Product: HVAC Evaporative Pads with Chitosan

Development Stage: Prototype Tested

Primary Inventor:

Andro H. Mondala,
Chemical and Paper
Engineering Department

Scientific Publication:

Mondala et al. TAPPI IBBC
Conference, Sept, 2014,
Tacoma, WA

License Status: Available for
Licensing

Patent Status: US

Application Filed from
62/192346

Reference: 2015-008

Contact:

Steve Weber Ph.D.
steven.weber@wmich.edu
269 387-8282

Currently, Phenol resins are widely used in corrugated and paperboard products as barrier coatings. A thinner such as evaporative cooling pads for agricultural livestock enclosures, where the air

permeability is important for cooling efficiency. However, the wet stiffness and water absorption rate provided by this coated paperboard is low, making its use, less desirable.

While other coating options like wax, extruded polyethylene, or acrylic resins are used, as with phenol resin, their untimely structural breakdown, low evaporative cooling performance and a lack of recyclability of the coated paperboard makes all these coatings expensive and less practical.

A natural biopolymer like chitosan is an environmentally friendly alternative to other coatings, as it is biodegradable, has low toxicity, and the coating process uses no volatile organic compound (VOC) or petroleum-based barrier coating chemistries. Chitosan is a plentiful coating material because it is derived from crustacean shell chitin or from the cell walls of fungi.

Technology Description

Researchers at WMU have created an efficient process for producing chitosan for coatings via fungal fermentation with

soybean and soybean waste. The researchers created a cooling pad with a single layer chitosan coating that is one-quarter the cost of the phenol resins and requires less coating weight, making the evaporative cooling pad lighter. They found that their cooling pad has better wet stiffness, wicking height, and water absorption, and is more air permeable than phenol resins for improved evaporative cooling.

During testing, the wet stiffness was initially found to be identical for the chitosan and phenol resin coated pads. After two days of immersion in water, the wet stiffness for the chitosan coated pad increased by 13% while the wet stiffness of the phenolic resin coated pad decreased by 7% due to the loss of the coating.

In addition, the chitosan can be applied as a single layer using environmentally benign methanol and acetic acid solvent or combined as an additive to the evaporative cooling pad as it is manufactured.

(continued on next page)

Potential Benefits

- Better performance parameters than phenolic resins: wet stiffness, wicking height, water absorption, air permeability
- Reduces operating costs for agricultural livestock enclosure HVAC systems
- Environmentally friendly coating and recycling of paperboard
- Requires simple, inexpensive coating equipment and control systems