TurbEx™ FLUID BED-COOLING TOWERS

CASE STUDY: Huhtamaki Pulp & Paper, U.S.A.

SYSTEM DESIGN DETAILS

HEAT TRANSFER	
Inlet Water Temp ºF	**53.3ºC**
Liquid Medium	**White Water**
Inlet Air Temp ºF	**27.8ºC**
Inlet Approach ΔT ºF	**< 1.67ºC (<3 ºF)**
Inlet % Approach	**99.9%**
Design Heat Transfer	**7.6 MMBtu/hr (2.2 MW)**
Heat Trans Coefficient	**See HTC below**
FLUID DYNAMICS	
Liquid Flowrate	**105m³/hr**
Operating Mode	**Once through**
Pressure Drop	**6.5" WG (1600 Pa)**
TOWER	
Column Diameter	**1.83m (6 ft)**
Overall Tower Height	**7.25 m**
Construction Materials	**SS 316**

Commissioned in late Spring 2016 this **TurbEx**™ COOLING TOWER cools process water at a Huhtamaki U.S. pulp & paper facility using TurboScrubber® fluidized packing to ensure continuous non-clogging operation even with sticky pulp & solids laden white water. The system is integrated with the plant process control system to maintain optimum operation.
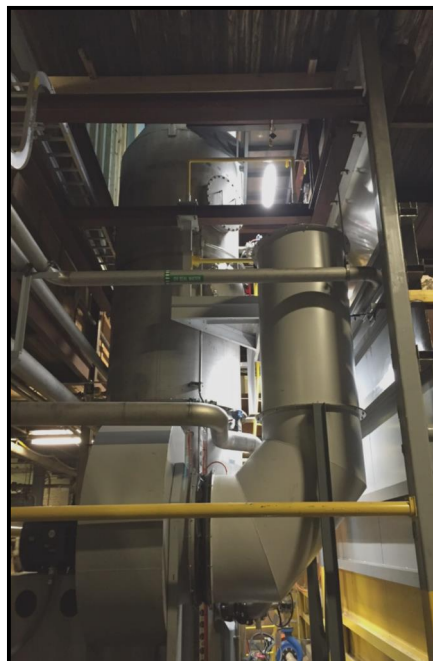

Despite operating during non optimal start up conditions with low water flow, low enthalpy (water inlet 47ºC) & high inlet air RH the heat transfer was still at 3.5MMBtu/hr (~1MW) & the outlet water temp within 3ºF of the inlet dry bulb gas temp. This equates to a 280 KW/m³K expanded bed HTC.

By comparison typical wet gas HTCs shown here for Ceramic Intalox Saddles (left) & Mellapak 250Y structured packing (with its 250m⁻¹ interface) are reported at between 5 & 30KW/m³K.
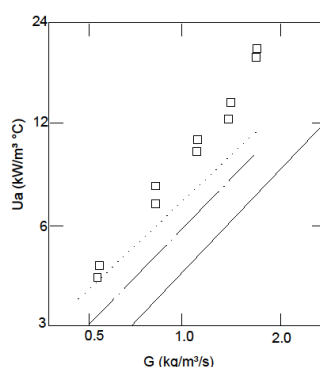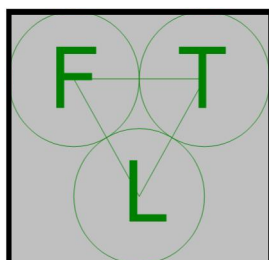

Comparison of Present Model with Results of Huang, L=2.71kg/m²
□ Huang Data
— Huang Model for ha_tg
— Present Model for ha_tg
···· Present Model for Ua,
1-1/2" Ceramic Intalox Saddles
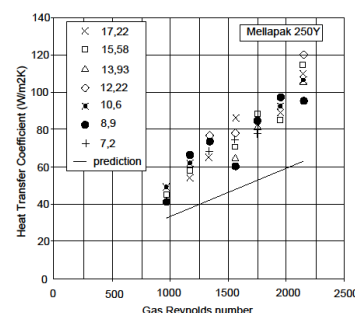
Heat transfer coefficient vs Re of middle section of the column (P= 1.5 bar abs)