DBBS. Technology *Advancing Building Energy Innovation*

NEW HVAC ZERO MIXING CONCEPT. For Significant Non-renewables and GHG Emissions Reduction on Residential, Commercial, Institutional Large Real Estate Assets and Industrial Batch Processing.

Denering Berrio – HVAC Specialist - DBBS Technology February 5th, 2020

Modern design for buildings' HVAC-systems is based on engineering fundamentals that promote hydronics Water-Mixing operation. The results, the development of building's heating and cooling systems that run under inefficient-ineffective low water temperature-differential limiting not only equipment performance but also loads distribution. The new Zero-Mixing concept, and the integration of patented Smart Buffer Tank (SBT), completely changes the nature of HVAC operation. SBT storing-intelligence eliminates building hydronics' Water-Mixing allowing systems to run at a much higher temperature-differential operation improving overall energy conversion and distribution. These, while also providing technical solutions to an unchecked number of other existing deficiencies, such as: plant cycling, part-load inefficient operation, system overruns, erratic signaling/control, and room temperature hiccups.

Zero-Mixing/SBT retrofits can substantially improve heat/cooling production capabilities reducing the consumption of costly non-renewables, improving system availability, operability, and minimizing equipment maintenance. And, since it truly maximizes HVAC's building performance, GHG emissions reduction provides financial relief from imposed carbon tax levy and creates opportunities on carbon trading.

Existing Retrofit Market and the Zero-Mixing Offering

After large-building infrastructure initial construction energy conservation enhancements are not often considered due mostly to the perceived low energy-efficiency benefits of existing HVAC retrofitting options. Decision makers are always concerned with the large upfront capital needed for installations and believe that energy retrofits [Light/In-depth] are too expensive with long paybacks and low ROIs. Commonly offered retrofits include the replacement of old equipment for newer more efficient products, building insulation improvements, and lighting for a combined energy improvement as high as 17%. More expensive retrofits, with much higher ROI, include solar-PV/thermal, heat-pump geothermal systems, and CHPs.

*Since most [Light/In-depth] retrofits rely completely on structural changes they barely achieve greater energy efficiency results [beyond 5% to 17% at best]. Post retrofitted buildings still run on an inefficient-ineffective **WATER MIXING** operation platform that limits not only heat/cooling output capacity but distribution operation. The new **SBT/ZERO-MIXING** retrofit eliminates **WATER-MIXING** operation truly busting system core performance by improving continuous hearing/cooling equipment high efficiency operation (≈95%) and building distribution.*

DBBS Energy Efficiency retrofit is a low-cost/low-risk proposition with the potential for much higher overall system EUI improvement and greater financial results (with higher NPV, ROI and shorter payback).

Other HVAC-systems such as heat-pumps, solar-thermal, Combined Heat & Power – CHP , batch-thermal processes, or chilled-water systems can equally benefit from ZERO-MIXING retrofits since their performance are also largely affected by WATER-MIXING and its effect in the water-return temperatures during reheating/cooling and distribution process.

Zero-mixing/SBT Building Heating Solutions:

- Improve heating plant operation, above 90% AFUE energy efficiency levels, for NG reduction [from 25% to 40%] in vintage and more modern Bldgs.
- Double Bldg.'s heating and/or cooling plant capacity with minimum added CAPEX,
- Double Domestic Hot Water (DHW) production by replacing existing commercial tanks with the new SBT,
- Reduce up to 40% HVAC related electricity usage (16% of building energy cost),
- Reduce Bldg.'s OPEX from improved system availability, operability and maintenance,
- Improve operations' cash flow by reducing the use of non-renewable, associated carbon tax levies and CO2 emissions trading,
- Reduce oversized equipment for new facilities – heating, ancillary equipment, pumping distribution and piping network sizing (on both primary and secondary loops), and lower capital investment cost, as well as future energy bills and maintenance costs relevant to operations.

Zero-mixing/SBT Solar-Therma Solutions:

- Maximize panel solar-adsorption. SBT thermal storage/ZERO MIXING concept; along with new DBBS' digital control strategy for high delta temperature operation, maximizes panel energy output at any outdoor condition, increasing solar fraction and therefore reducing supplemental boiler heat.
- Minimize system-hydronic and pumping equipment oversize on newly designed facilities, slashing capital investment cost by half, and improving project feasibility. (SBT integration enables higher temperature system/storage differential $\Delta T \approx 40°C$, compared to customary $\Delta T \approx 10°C/20°C$.)

Zero-mixing/SBT Combine Heat and Power (CHP) Solution:

ZERO-MIXING/SBT retrofit integration Improves overall plant thermal efficiency by eliminating heat-transferring diminishing-returns due to water-mixing during the reheating and storing process operation. (Since CHP produces both heat and power simultaneously, with daytime power demand usually offsetting heat energy demand periods, efficient thermal storage needs to be readily available during daylight power generation hours. The SBT allows cogeneration by-product excess heat to be efficiently stored at a much higher temperature differential, offering larger thermal mass (with greater opportunity for energy capture) than a similar commercial tank with the same dimensional characteristics.)

Zero-mixing/SBT Industrial Application Solution:

ZERO-MIXING/SBT improves batch-process thermal efficiency by eliminating water mixing during storage and release operation. (This alone can greatly increase process output economy in industrial settings that are so dependent on heat-production processing and storing. Suggested SBT and flat-plate heat exchanging configurations favour more efficient full force-convection heat-transfer operation with much higher temperature differential between exchanging fluids (for greater energy-density transportation), doubling the thermal storage capacity of a conventional tank.)