agrilab TECHNOLOGIES
Compost Powered Heat

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Case Study: The Compost Heat Wagon™ at City Soil & Greenhouse, Boston, MA

The ***Compost Heat Wagon™ 250*** is a next-generation compost aeration and heat recovery platform developed by Agrilab Technologies, Inc., which owns multiple patents on the compost heat recovery process. It has similar core components, functionality and performance as the ***Compost Hot Skid 250R™*** and the ***Compost Hot Box 250R™***.

The compost aeration, heat recovery, data capture and system control mechanicals of the ***Compost Heat Wagon 250™*** are built into a cargo trailer for fast flexible deployment with any aerated static pile (ASP) compost production area. It is shown below connected to an ASP compost pad built at City Soil & Greenhouse in Boston, MA. Heat, condensate-water and C02 captured from the compost aeration system are supplied to a winter greenhouse - the home base of the ***Mattapan Ecovation Center***. The greenhouse was kept productive throughout the entire winter of 2015-2016 without additional heating inputs. The Mattapan Ecovation Center recently was presented with the ***Greenovate Boston Award*** by Mayor Walsh for its urban agriculture, resource recycling and renewable energy innovations.

Compost Heat Wagon connected to ASP

Compost feedstock on ASP pad before hoop house was skinned

Greenhouse hot water tank and biofilter growing beds

Operational Summary:
Water is circulated from the storage tank in the greenhouse to the heat exchanger in the ***Compost Heat Wagon 250™***. A variable speed water pump can be computer-controlled to maximize the heat recovery of the system. The compost aeration fan has a variable speed drive that can be controlled manually or by computer. This allows for process optimization to match the volume of compost being aerated, meet compost processing goals, maintain oxygen level in the material between 8-12%, and maximize the compost vapor flow rate through the heat exchanger.

The water flow rate through the heat exchanger in this case was 8 gallons per minute (gpm) The vapor flow rate was 210 cubic feet per minute (CFM), which corresponds to the aeration level recommended for the 120 cubic yards of leaf and yard waste being aerated.

Computer controls and data capture systems track the temperature of the compost, vapor flow rate, vapor humidity saturation level, compost moisture content and the overall amount of thermal energy captured.

Compost Heat Wagon control panel, aeration fan, heat exchanger and condensate collection

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Heat Recovery Performance Summary:

The thermal power of the system, in Btu/hr, is measured by multiplying the mass flow rate of the water times the temperature increase. To test the accuracy of AGT's established heat recovery models, we insert data from 1:20 AM on October 10th in the chart below, showing the Btus captured and the actual vapor saturation level, compared to projected Btus at various vapor saturation levels. This shows that the measured results outperformed the model and that AGT's heat recovery projections model is conservative.

The rise in water temperature during this operation cycle in October was from 112F to 123F with water circulation of 8 GPM, which equates to 44,000 Btu/hr captured for greenhouse heating. Because the compost feed stock was several months old and had unusually low moisture content the vapor saturation level was only 54%, compared to normal compost vapor which is 90% to 100% saturated with moisture.

The actual measured Btu output exceeded our projections significantly, capturing 44,520 Btu/hr. If this volume of compost feed stock was at proper moisture levels AGT's conservative heat recovery models project that the system would capture more than 107,000 Btu/hr. The maximum recommended CFM for the ***Compost Heat Wagon 250™*** is 400, which would yield more than 200,000 Btu/hr according to AGT's established conservative heat recovery model.

	Vapor Humidity Saturation	Btus/hr	Water In Temp	Water Out Temp	Gallons Per Minute Flow	Vapor In Temp	Vapor Out Temp
Measured Actual Outputs:	**54%**	**44,520**	**112 F**	**123 F**	**8**	**149 F**	**112 F**
Modeled Outputs:	**54%**	**34,900**	**112 F**	**121 F**	**8**	**149 F**	**114 F**
Modeled Outputs At 100% Vapor Humidity Saturation	**100%**	**107,600**	**112 F**	**126 F**	**8**	**149 F**	**126 F**