Living 'BioWall' of plants could clean household air, lower energy bills

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The
Planting a
What is it?
The Biowall is a vertical plan
that integrates with a ho
heating, ventilating, and
conditioning (HVAC) system.
placed in a highly visible loc
where the plants can be seen
enjoyed by the occupants. Air
through the growth media of
plants gradually removes airb
contaminants, such as vola
organic compounds (VOC), from
air. A Biowall provides a nat
aesthetic that contributes toward
modern and sustainable lifestyle.
Purpose
Indoor air quality is becoming a m
health issue, especially in airt
buildings. The accumulation of gase
contaminants like VOC and Carb
dioxide in indoor air increases he
risks. The Biowall cleans air using
natural ability of microbes surround
the root structures of plants
metabolize contaminants from indo
air.
The Biowall consists of several rem
plant species are grown in a loose so
that also allows for air flow. These
home's central HVAC system. Behi
to optimize air cleaning and plant hea
AeL

Purdue researchers are currently studying the BioWall project prototype at the ReNEWW House. A joint venture between Purdue and Whirlpool Corp., the ReNEWW House allows graduate students to monitor a host of incorporated novel energy saving technologies. Credit: Purdue Research Foundation photo/Curt Slyder

Homes of the future could have cleaner air and lower energy bills due to a Purdue team's BioWall innovation involving the use of a living wall of air-cleaning plants.

"Over the past century there have been initiatives to create more airtight buildings that increase HVAC efficiency and reduce power consumption," said Scott Massey, a Purdue senior majoring in mechanical engineering technology and member of the BioWall research team. "Unfortunately, the side effect of this trend is that is has reduced indoor air quality. The BioWall is a solution for that problem."

The BioWall is an air filter consisting of shelves of plants built into a wall and attached to a home's HVAC system. Built-in systems provide light and water. A fan behind the unit draws air into the BioWall and through the growth media where microbes in the plants' roots process volatile organic compounds, or VOCs. The plants also remove carbon dioxide from the air. The cleaned air then returns to the home's HVAC unit for heating or cooling.

The current prototype has been in place at the ReNEWW House since 2016. A joint venture between Purdue and Whirlpool Corp., the ReNEWW House - a retrofitted, net-zero energy, water and waste house - is a 1920s era home near the Purdue campus for graduate students to

monitor a host of incorporated novel energy-saving technologies.

BioWall team member Scott Massey, a Purdue senior majoring in mechanical engineering technology, checks on the BioWall prototype at the ReNEWW House. Credit: Purdue Research Foundation photo/Curt Slyder

Data from the ReNEWW House shows the BioWall prototype has the potential to reduce HVAC energy consumption by up to 25 percent because less outside air is required for ventilation.

"We have a research prototype," said Bill Hutzel, a professor of mechanical engineering technology in the Purdue Polytechnic Institute. "Over the next year we'd like to develop a pre-commercialization

prototype."

Current research is centering on types of plants to use in the BioWall, plant-watering algorithms and other efforts to maximize the potential benefits. The team is also discussing the possibility of establishing maintenance agreements as a potential commercialization effort.

"The last thing you want is for the plants not to be maintained," Hutzel said. "Through a maintenance agreement, the plants could be regularly monitored. You could also swap out plant trays based on the season."

The idea for the BioWall originated from Purdue's participation in the 2011 Solar Decathlon sponsored by the U.S. Department of Energy. The program challenges collegiate teams to design, build and maintain solar-powered homes that are energy-efficient, cost-effective and attractive to potential buyers. Purdue's purpose-built, solar-powered house featuring an early version of a BioWall took second place overall in the national competition.

Provided by Purdue University