Air/Water Purification

At left is Dr. B.C. "Bill" Wolverton, a member of the Space Technology Hall of Fame and perhaps the world's leading pioneer in utilizing plants and microorganisms to solve air and water pollution problems.

Wolverton, a retired NASA researcher who served 18 years at Stennis Space Center, (SSC), recently formed his own company — Wolverton Environmental Services, Inc. (WES, Inc.), Picayune, Mississippi — to provide technology and consultation in such areas as indoor air pollution abatement; domestic/industrial wastewater treatment; and aquaculture, the use of aquatic plants to remove pollutants from wastewater at relatively low cost.

At right is part of Wolverton's Picayune home that is actually a laboratory for one of WES, Inc.'s research programs. It is the first combined indoor wastewater treatment/air purification system employing common houseplants.

The plants absorb potentially harmful gases and chemical compounds to purify home or office air and water. Wastewater is pumped from the bathroom and fumes from the kitchen into a living room filtration system of plants — ferns, ficus and philodendrons — reinforced by activated carbon filters. The wastewater is used as water fertilizer for the plants, which purify the indoor air and at the same time convert the wastewater to clean water. The system, operational for three years, has demonstrated the practicability of this concept. WES, Inc. has licensed several companies to manufacture and market high efficiency indoor air filtering devices.

The first public building to use the technology is a new math and science complex at Northeast Mississippi Community College (Booneville). The design of Wolverton's Booneville plant filtration system calls for routing ventilation air through a two-story atrium equipped with filter boxes of plants, clay and charcoal. The plants purify the air and additionally cleanse sewage from the building's bathrooms, recycling the water for use on campus gardens.

Wolverton and his aides at SSC's Environmental Research Laboratory (ERL) began experimenting almost two decades ago on ways to cleanse, detoxify and reuse over and over the initial supplies of water and oxygen to be carried by future long duration spacecraft. In 1974, the ERL started investigations of aquaculture, with initial focus on the water hyacinth, which can absorb astonishing amounts of pollutants. After successful demonstrations at SSC, a large number of communities adopted aquaculture for either primary or supplementary wastewater treatment.

Since water hyacinth applications are confined to warm weather areas, Wolverton's group developed a second

generation cold-tolerant "artificial marsh" system employing a combination of pollutant absorbing plants and sewage-digesting microbes. More than 100 U.S. communities have since adopted the artificial marsh technology.

WES, Inc., has continued research and application of aquatic plant/microbial wastewater treatment systems started at SSC. WES, Inc. systems are in operation in a number of U.S. towns, particularly in Mississippi and Louisiana. Wolverton also offers designs for treating industrial wastewater in facilities ranging from poultry processing to chemical manufacturing plants. The first chemical company to adopt aquatic/microbial technology as part of its wastewater treatment process is Degussa Corporation, Theodore, Alabama.

A new application is treating water for fish farming; because of the tremendous amount of water needed for intensive fish culture, WES, Inc. is working with fish farmers on applying aquatic plant/microbial filters to treat and recycle their water.

There are about 100,000 acres of catfish ponds in Mississippi. Certain forms of nitrogen become toxic to catfish, particularly in intensively stocked ponds. There is a further problem in that noxious effluent from the catfish ponds pollutes rivers feeding into the Gulf of Mexico, a major concern of the U.S. Department of Agriculture (USDA).

Artificial marsh technology is being evaluated as a purification system at the catfish farm of Truman Roberts in Purvis, Mississippi by the University of Southern Mississippi (USM), working under a grant from the Gulf of Mexico Program with technical assistance by USDA's Soil Conservation Service.

At the Roberts farm, a one-acre wetland filter cleans water from the catfish production pond, removes toxic nutrients and recycles the water back to the production pond. At **left above**, water from the Roberts catfish pond is flowing into the filter pond for cleansing; at **right above** the cleaned water is being sprayed back to the catfish pond. Initial evaluations by USM biologists indicate that the artificial marsh is effectively improving water quality and removing toxic substances. Bonuses include the farmer's ability to increase stocking rates per acre, creation of wildlife habitat, and cleaner discharges into local waterways that feed into the Gulf of Mexico. ●