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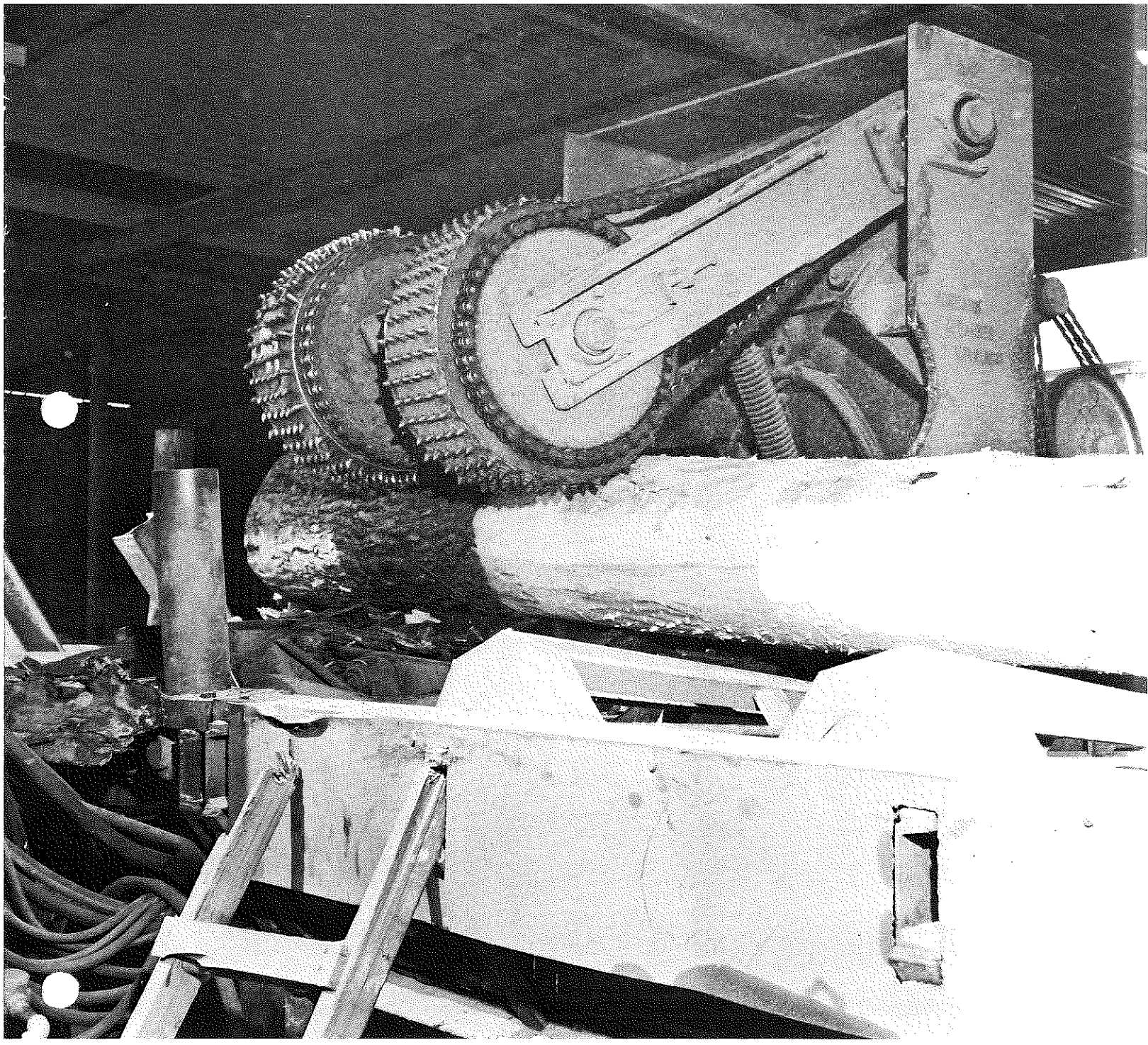


More than 185 million tons of wood waste a year is a by-product of an affluent society. Now the problem — **what to do with it.**

WOOD WASTES

Disposal or Utilization ???

Many new industries are using wood chips for producing decorative paneling and kitchen counter tops.

The yearly disposal of more than 185 million tons of waste material is one of the shameful aspects of our affluent American Society. The daily disposal of more than one-half million tons of wastes presents an increasingly difficult dilemma as to the best methods for disposal. It is only too prevalent that waste disposal has followed the expedient methods of burn, bury, dump, and forget. These methods are now considered as costly, wasteful, and detrimental to our environment.

The burning of waste products in a poorly controlled manner is a most serious source of air pollution. Available space and desirable locations for dump and landfill sites are becoming major problems in most metropolitan areas. The costs of maintaining and developing such operations to accommodate increasing yearly demands is becoming economically prohibitive. It is therefore essential that more efficient and economical methods of solid and liquid waste disposal be diligently researched and applied.

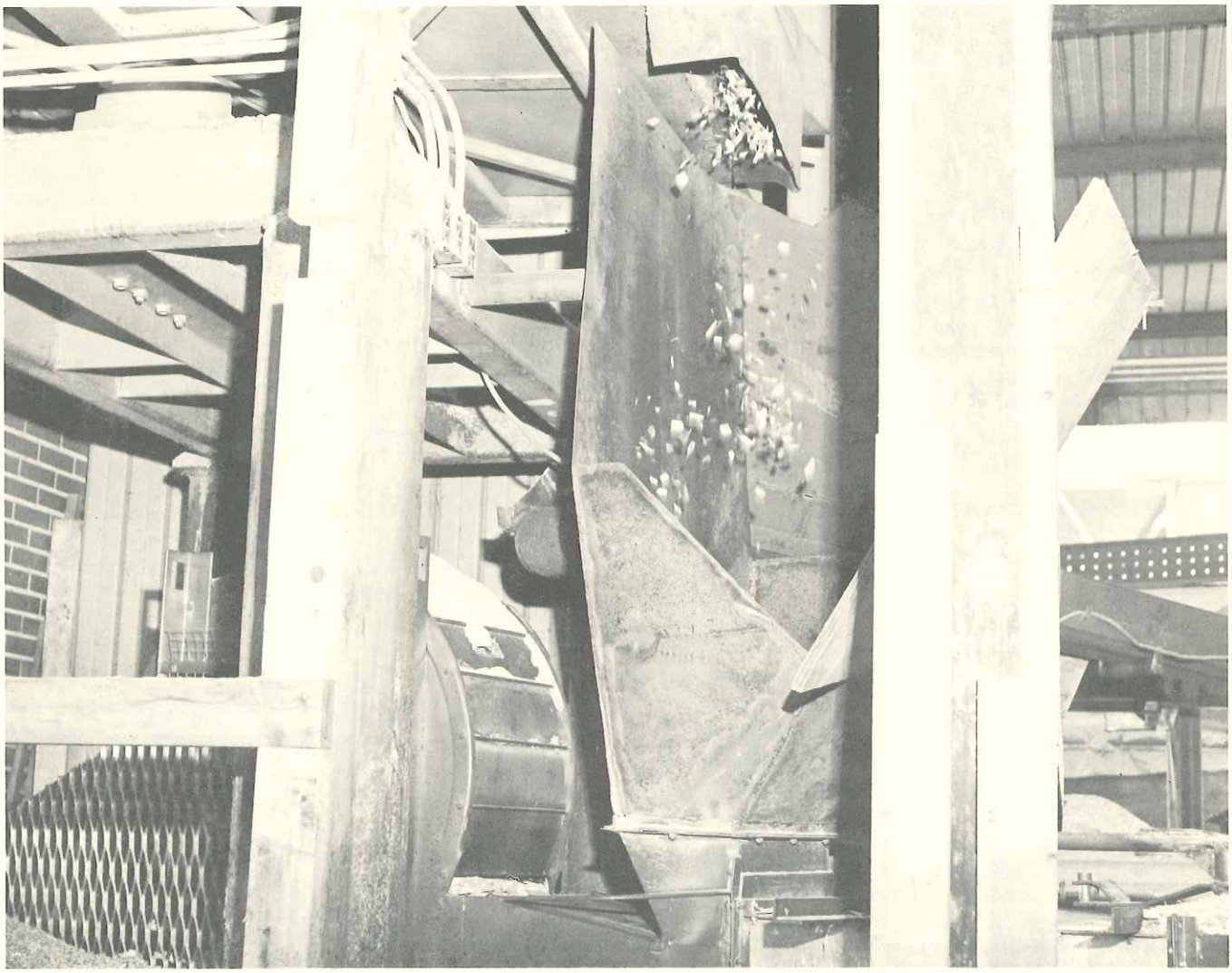
In answer to these challenges man is learning that yesterday's waste can indeed become the raw material for tomorrow's new industry. What was once considered in the account books as a business loss is fast becoming a new margin of profit. The development of new waste product industries and markets take time, thought, research and money. It is therefore most important that both society and industry recognize this problem and place emphasis on the achievement of both satisfactory disposal methods and proper utilization of wastes.

The problem of disposal or utilization of waste products associated with wood industries is the subject of this discussion. Major wood waste sources we will be concerned with here are:

1. Wastes from forest timbering and land clearance projects.
2. Wastes created from pulp-wood harvesting and processing for the paper products manufacturing industry.
3. Wastes created from sawmill operations including debarking, slabbing, and rough-sizing of timber.
4. Wastes from the manufacturing of furniture, the construction industry, and the numerous producers and manufacturers of a variety of other wood products.

These users and handlers of wood all have one common by-product, wood waste. The most expedient solution for the disposal of wood waste has initially been the economically attractive method of burning. In the long run, however, this solution is not satisfactory. It creates an air pollution problem and can cause fire hazards.

The various methods of burning wood waste and their values, are:



Scrap wood in this modern lumber mill is sent through a chipping machine before being sold to a paper manufacturer.

1. Open burning—Provides no actual combustion control, considered a fire hazard, and is prohibited by the Michigan Air Pollution Control Rules and Regulations.*
2. Tepee type burner unit—Provides a means of waste containment and some combustion control, but is inadequate in limiting air pollutant emissions to standards promulgated by the Michigan Air Pollution Control Commission.*
3. Silo type burner units are stationary, refractory lined, and will sustain higher burning temperature. These units can be constructed or converted to the equivalent of a multiple chamber type of incinerator with collector equipment at the outlet to adequately control emissions.
4. Furnace or boiler units—Usually provide more complete combustion control for efficient burning, but may require additional collection equipment to insure an adequate control of emissions.
5. Incinerators—Designed for the destruction of particular waste material, provide efficient combustion, and can limit emissions to acceptable levels with adequate design and appropriate collection equipment.

One major factor yet to be overcome in the problem of wood waste burning as noted above is of the greatest importance to our environment. It is the resultant contamination of the atmosphere in which we live.

If burning is to be selected as a means of disposal, then it must be accomplished in an efficient and controllable manner. Emission from any waste product burner unit, whether it be a furnace, boiler, or incinerator, must be controllable to less than the maximum allowable emission rates as defined by the design capacity in pounds per hour of wastes burned:

1. 0-400 pounds of waste per hour: the limit is 0.65 pounds of particulate per thousand pounds of flue gases (corrected for 50% excess air).
2. Greater than 400 pounds of waste per hour: the limit is 0.30 pounds of particulate per thousand pounds of flue gases (corrected for 50% excess air).

*See Volume 13-1, Fall 1967 Michigan's Occupational Health

Michigan's rules on air pollution also outline standards for smoke density, prohibit open burning and set guidelines requiring permit application and permit approval for the installation, operation or alteration of any incineration devices.

UTILIZATION

In contrast to the expedient disposal of wood wastes by burning, alternative utilization of these wastes is suggested as follows:

One of the largest potential users of wood waste is the farmer. Wood residue in any form can be processed to provide mulching material or bedding (litter). The agricultural benefits to be derived from wood wastes are most important. It should be emphasized that a commodity as useful and valuable to the farmer should no longer be considered for disposal by industry through destructive burning. This semi-natural resource should then be made fruitful and returned to the economy of the nation.

A great deal of research by the Forestry Division of the Michigan Department of Conservation has revealed many beneficial uses of wood wastes for agricultural and commercial use. A wood mulch, for instance, used as a soil conditioner can provide several major benefits to farmers, which include:

1. Soil holding cohesiveness—Prevents wind erosion of light sandy soils.
2. Moisture retaining ability—Affords increased absorption by the soil, holds moisture longer and reduces evaporation losses.
3. Control of weed growth—Suppresses weeds and retains ground warmth.
4. Increased soil body—Improves tilth, structure, aeration, maintains uniformity and granulation, and builds up organic matter and humus in soil.

In addition to improvements in the soil which are very important, the use of wood waste as a bedding material for cattle and/or poultry is an added benefit for the farmer. Some advantages for wood waste litter are:

1. It costs up to 50% less than straw.
2. It does not mat or cake but retains resilience for improved moisture control.
3. It absorbs more moisture than straw thus providing a comfort and health factor for livestock.
4. It reduces fire hazards and odor.

Wood waste used as bedding may ultimately be disposed of by spreading and tilling into the land as a soil conditioner.

It was once believed that the addition of wood mulch to the land would make the soil toxic or acid. It is true that there is an initial depletion of the nitrogen content in the soil, but this is overcome by adding nitrogen to the mulch.

USES OF SAWDUST AND SHAVINGS BECAUSE OF SPECIAL PHYSICAL QUALITIES

Use	Users or Purchasers	Remarks
FOR ABSORBENT QUALITIES:		
Bedding		
Stable	Chiefly farms and dairies	Use subject to expansion to utilize valuable liquid stable manure commonly lost
Kennels	Sawdust dealers	
Floor Coverings		
Factories Fish markets Garages Hotel kitchens Machine shops Meat markets Packing plants Tanneries Taverns Vegetable markets Warehouses	Purchased through sawdust dealers or directly from producer	Absorbents are the greatest single outlets for dry sawdust. Green sawdust should be acceptable in some cases
Grasshopper Belt	Government and local authorities	Poisoned with arsenic. Used only in critical years
Leather Working	Tanneries	

Nitrogen used in this manner is actually more beneficial and longer lasting than it is when applied directly to the fields. With this new form of top soil conditioning farmers are learning that a minimum amount of care and watering will produce increased crop yields. Particular successes have been noted where actual usage of treated wood mulch has provided as much as a seven-fold increase in crop production. Fruit farmers using wood mulch in their orchards have reduced damage to crops thus providing an increase in salable fruit products.

Parks and recreational areas have found additional uses for wood waste in its raw form. A combination of bark, sawdust, and shavings are being used as cover for riding and hiking trails, picnic areas, recreation grounds, and as soil for model and ornamental plantings. In these cases, the product not only provides natural scenic beauty, but offers a controllable safety factor for preventing fires and injury.

Returning wood waste to the ground as simple landfill is another useful reclamation project for future land development.

In some areas, wood waste is used as fuel to provide heat or power for home and industry, steam for utility plants, or is processed to make charcoal for the backyard chef.

Many new industries using wood chips in the production of decorative wall paneling for homes and offices are springing up across the country. Sawdust too is finding its way into the American home. Mixed with a bonding agent, it is being made into a hardboard that can withstand extreme weather conditions throughout the year.

The future of wood waste products is unlimited. More and more, modern technology is discovering new ways to utilize this resource. Presently, researchers are examining the possibility of combining wood chips and slabbing wastes with pulpwood for use by the paper manufacturing industry.

A limited amount of wood waste combined with cement is used in the production of strong, lightweight, concrete blocks for the building trade. Chemical products, are being extracted from wood wastes by means of: (1) distillation, (2) hydrolysis, (3) fermentation, and (4) hydrogenation.

The fibers of wood residue are being considered for use as: (1) fillers for saturating felt, (2) fillers in asphalt shingles, (3) low-grade pulp for container liners, and (4) core stock pressed board and molded fiberboard products.

The creation of wood flour, mixed with silage and dietary supplements.

Use	Users or Purchasers	Remarks
Mulch Soil Conditioner	Farmers and nurserymen	Has limited use except as combined with and as a carrier of fertilizing matter
Signal Rockets and Fireworks		
Wound Dressing and Special-Purpose Hospital Mattresses		For special use only. Extent probably very limited
FOR ABRASIVE QUALITIES:		
Cleansing Soaps	Specialty manufacturers	
Floor Sweeping Compounds		
Commercial	Made and distributed by numerous oil, chemical, and janitor supply companies for use in schools, stores, office buildings and the like	Green sawdust used in one type now being tried
Household	Householders	As a dust retardant for sweeping basement floors; as a material for sprinkling on icy steps, domestic outlets in small but numerous lots are possible
Fur Working		
Cleaning Dressing Dyeing	The fur manufacturing trade concentrated in New York City; also numerous cleaners elsewhere. Users usually supplied by sawdust dealers	Stock coming largely from maple-flooring plants
Metal Finishing		
Cleaning Drying Polishing (From pickling bath, plating solution, lathes, machines and the like)	Sawdust dealers	Used chiefly in tumbling drums
Poultry Picking		Believed to be only occasional use
Synthetic Abrasives		
Carborundum	Manufacturers of abrasives	
FOR BULK QUALITIES:		
Circus Rings and Riding Stables	Regular dealers and riding stables	
Clay Products-Special		
Porous brick and tile	Specialty manufacturers	For reducing density and weight
Composition Flooring	Limited commercial experimentation	Used with various cements to give insulating and resilient properties
Molded Novelties	Small novelty producers	Plaques, novelty jewel cases, furniture ornaments, and the like
Packing		
Glass, china, canned and bottled goods. Metal ware	Shippers of liquids, glass, china and other fragile items	
Building stone	Shippers of building stone	Packed between finished stone on flat cars, and the like

has been tested as cattle feed. It appears that more research will continue in this area, but reports indicate that cows thrive on this feed.

Ski resorts take note: Hogged wood waste can be used as a base for ski slopes. It not only helps prevent slope erosion, but will reduce weed growth, provide a resilient cushioning effect, and can extend the skiing season with reduced melting of snow. Some research has already been directed toward the possible use of sawdust as an artificial off-season snow substitute. Though this is in the future, there are many present uses for sawdust, such as: an absorbent for spilled liquids, an abrasive for hand soaps, metal polish, fur cleaning, and sweeping compounds. The bulk and fibrous qualities of sawdust are found adequate for the manufacturing of wood flours, packing materials, and light weight cement aggregates. It is used as nonconductive building insulation, for granularly-textured surfaces and for oatmeal textured wallpaper. A more complete list of usages can be found in the included Table.

SUMMARY

In spite of the many advances man has made toward utilization of wood wastes, the battle to eliminate these wastes completely is far from over, but it can be solved. The problem was not created overnight. It cannot be corrected without considerable study and effort. It is up to industry and local communities to begin now to find a mutual solution to this waste problem.

Disposal by burning creates local air pollution contamination. This can be controlled to a considerable extent through the burning method selected and the controls or collection equipment used.

Utilization of the product eliminates waste disposal. It may even save money.

—C. O.

Use	Users or Purchasers	Remarks
Grapes	California grape growers	Often made specially by cutting
Nursery stock	Nurseries	Packing about roots of plants, shrubs and the like, in shipping
Plaster Board	Certain plants making plaster board	Usual mix is 4 to 5 per cent by weight. Is being replaced by foaming compounds
Sawdust-Cement-Concrete		
Poured	Scattered building contractors	Not widely used, but sometimes advocated for cow and poultry barn floors
Cast blocks and panels	Same as preceding	Precast to panels or blocks for easy handling and to avoid cracking and warping in setting. Includes certain patented formulas and special trade names
Stuffing Toys		
Animals and Dolls	Doll manufacturers	
Wood Flour		
Special types For burn-out mesh in ceramics	Some manufacturers of firebrick and ceramics	
Usual types	Specialized plants drawing waste from planing mills, box factories, millwork plants	Gradually increasing use in manufacture of linoleum, plastics and the like
FOR NONCONDUCTIVE QUALITIES: **Concrete Protection**	Building contractors	Coverage to prevent too rapid drying
Insulation Building, Ice houses, Refrigerator cars, Sound, Water pipes	Builders and operators of use items listed in Column 1	Used formerly more than now. Possibilities probably not fully exploited
FOR GRANULAR QUALITIES: **Display-Window Decoration**		
Texturing Oatmeal Wallpaper	Specialty paper manufacturers	

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Automatic Air Sampling Stations now in operation

Two of these units are presently on line at Port Huron where they play an intricate part in the International Joint Commission Air Pollution Study between the United States and Canada.

Continuing its leadership role in the fight against air pollution, the Michigan Department of Public Health, Air Pollution Control Section has recently unveiled four new Mobile Air Pollution Monitoring Stations; three 13′ satellites and a 20′ master module.

The equipment was dedicated recently on the front lawn of the Capitol Building in Lansing when Lt. Governor William Milliken electronically ordered the master unit to activate its sensors for a gaseous and meteoroligical readout. Simultaneously, the command unit signaled for and received atmospheric data from a satellite station five miles away.

The chief of the Air Pollution Section for Michigan noted that by acquiring the four sampling trailers, the Department is now in a position to assess the quality of air in any community of the state including those areas experiencing air pollution difficulties. The units will also be activated in virtually clean air portions of Michigan where anticipated population and industrial growth make it necessary to assess ambient air levels for baseline information. The term ambient air refers to normal levels of certain common contaminants in the atmosphere such as sulfur dioxide, carbon monoxide, hydrocarbons, oxides of nitrogen, and suspended particulate matter.

The central control module of the system is programmed for determining quantities of sulfur dioxide, oxides of nitrogen, carbon monoxide, hydrocarbons, wind speed, wind direction, and temperature. Suspended particulate matter is measured with portable high volume air samplers.

The three satellites are equipped with delicate electronic sampling equipment and recorders to determine wind speed, wind direction, and to measure the amounts of sulfur dioxide in the atmosphere.

Two of the units are presently on

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line at Port Huron, Michigan where they play an important role in an International Joint Commission study program of air pollution between the United States and Canada.

There are several aspects of the monitoring system which are unique. The sampling equipment, for instance, is designed for continuous automatic atmospheric sensing to provide engineers with minimum, maximum and average air quality values for any specified time period. These values are also correlated with meteorological data.

A specially designed electronic data acquisition and retrieval system is housed in the master monitor with an interconnection to all other trailers by means of telephone lines. At predetermined intervals, sensors in the command module query its own air sampling equipment and the equipment installed in the satellites for atmospheric data. The information is automatically transmitted to the module telemetry system to be sorted and reproduced on teletype print out, and on an eight channel punch tape. The tape is transfered to a computer center where the data is processed and a data format of a desired style is produced.

With an eye to the future, engineers have designed the data asquisition and retrieval system to accommodate additional satellites and equipment.

Michigan is a leader in air pollution control as it is characterized not only by program results achieved to date, but also by the fact that it is moving ahead in the technological aspects of air quality management. The mobile sampling system is one prime example. It is expected that the Air Pollution Mobile Monitoring Stations will serve as an assist in the systematic and reasonable implementation of Michigan's air pollution control program and will serve as a significant contribution to the total efforts to manage our natural air resources.

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