Waste Treatment Methods[1]

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INDUSTRY, TAKEN AS A WHOLE, was not too concerned in the past with what happened to their wastes so long as there was some convenient method of getting rid of them. In recent years this attitude has undergone a change which, although not entirely voluntary on industry's part, has resulted in the realization that the problem of proper waste disposal is a very real part of their operation. Gradual tightening of antipollution requirements by the various governmental agencies involved, a desire for improved public relations, the economics connected with recovery of usable material, and many other factors are responsible for the increased interest. We cannot help but feel that this trend will continue and that industry will become even more concerned with proper waste treatment in the future.

Wastes and the methods of treating them consist of both sanitary sewage from domestic sources and the waste products of industry. Many of the treatment methods and processes are common to both types of waste. Our experience in the field of industrial waste treatment has been primarily with food processing, meat packing, milk processing, and vegetable canning.

The design of waste treatment facilities is at best a somewhat indeterminate science. Sewage has been aptly described as being the end-product of a city or industry and reflects the habits, the method of living, the character of the city or industry producing it. No two cases can be considered identical. The use of empirical formulae and rules of thumb, so familiar in other forms of engineering, cannot be relied on with any degree of certainty. In every case the characteristics of the specific wastes must be carefully considered before proper design can be accomplished.

Wastes may be defined as organic or inorganic materials, normally in a water solution or suspension, of which recovery and salvage are not economically feasible. There are three basic reasons for waste treatment: first, to protect the public health; second, to stabilize objectionable organic material; and third, to remove chemicals that might cause damage.

ONE OF THE first considerations in the design of any treatment plant is the degree of treatment to be provided. Treatment plants are somewhat loosely classified as providing either "primary" or "complete" treatment. Primary treatment generally consists of settling of the waste to remove the readily settleable solids, and some method of treating the solids. It will generally remove from 10% to 45% of the polluting material, depending to a large extent upon the characteristics of the waste. So-called complete treatment provides secondary treatment of the waste through the use of one or more stages of filters, activated sludge, or other methods which will be described in greater detail. This type of treatment will remove from 80% to 95% of the polluting material.

There are also various forms of partial treatment falling in the range between primary and complete treatment. The degree of treatment to be provided is generally determined by the nature of the lake or stream into which the effluent will be discharged, by government regulations, and by economic considerations.

Prior to the establishing of the basic waste treatment conditions, it is fundamental that an in-plant or in-city survey be made to eliminate from the volume of waste to be treated all liquids that can be disposed of without treatment. Basically an in-plant survey should classify the waste under four different groups: first, the clean water that needs no treatment; second, the extremely strong wastes that can profitably be evaporated to dryness; third, the wastes that are too weak to justify evaporation and too strong for biological treatment; and fourth, those wastes that are amenable to biological treatment. Under certain conditions it is possible to combine the last two classifications.

It is customary to classify wastes, using the five-day biochemical oxygen demand, and the figures used herein are based upon the standard BOD test. In general, wastes which have a BOD in excess of 14,000 to 20,000 p.p.m. should be evaporated. If there is a large quantity of such wastes and if adequate steam is available in the plant, this should be done in multiple-effect evaporators. The strengths where this becomes feasible should be to some extent dependent upon the value of the dry materials to be recovered. As an example, certain recovered materials could be nitrogenous, having some value as feed and, as such, might be worth from 2 cents to 4 cents per pound on the market and therefore help defray evaporation cost.

Wastes that have a BOD of from 5,000 to 14,000 p.p.m. can be treated economically with what is known as Buswell Digestion, which consists in the holding of all the wastes, liquids, and solids for a period of from three to five days. This requires careful temperature control; and the feed, in terms of microbial food, into the digestor should be fairly uniform.

WASTES HAVING strengths below 5,000 p.p.m. BOD can be treated by any of the biological, chemical, or flotation methods. Biological treatment is usually based upon separating the liquids and the solids and treating each under different conditions. Biological treatment can be accomplished by many different methods, of which the following are the more common:

The biological filter type of plant consists usually of four basic units, a settling tank, filter, another settling tank, and some method of treating the solids which are removed. The settling tanks function to provide purely mechanical quiescence.

The word "filter" is a misnomer. Actually it is not a filter in the mechanical sense but rather a unit designed to provide maximum growth, under aerobic conditions, of bacteria, protozoa, molds, worms, and other micro-organic life which accomplish the true function of the filter, *i.e.*, to create a relatively easily removable floc through a continuous cycle of growth through feeding on the sewage applied to the filter and sloughing off. These micro-organisms are those normally existing in soil and present in sewage, and the filter does not require inoculation by any special group to function.

Filters are divided into three general classifications: low capacity, high capacity, and high rate. The low capacity filter was developed in England, and the mechanics of operation are such that the micro-organic life or flora in the filter receives sewage for only a short period of time in the 24-hr. period. The method of distribution of sewage over the top of the filter media is accomplished by one of two methods. One uses fixed nozzles and a dosing tank in which the liquid is sprayed on the filter about one-tenth of the time. The second type uses a rotary distributor and a dosing tank and maintains about the same time of feeding in a 24-hr period. These two methods are known as standard filters and have been used successfully for 50 years or more. The theory of intermittent feeding thus accomplished was accepted as necessary for many years. It will become obvious that the low capacity filter is considerably more expensive than other types because of the use of this intermittent feeding theory, making this type of filter about eight times as large as those employing continuous application of the liquid.

The high capacity filter is based upon the theory that the filter flora should be fed continuously at their maximum ability to cause the necessary chemical change. The function of a distributor of a high-capacity filter is to produce a rain-like action over the top of the filter media continuously over the 24-hr. period, with low night flows being increased by means of recirculated liquid. This high capacity filter is about one-eighth of the size of the low capacity filter with a consequent material saving in cost.

The high rate filter is based upon the continuous application of sewage to the top of the filter. The low flows are increased by the use of recirculated liquid, but no attempt is made to cover the top of the filter as a whole with sewage. The distributor used is of the low capacity type, but the dosing tank is omitted and recirculated liquid maintains sufficient flow to keep the distributor turning. Compared to the high capacity distribution, the momentary rate of application or feeding of the flora is very high.

The very large majority of filters use rock as a medium, usually from 2 to 4 in. in size and of a type that is resistant to the particular waste to be treated.

Another filter medium is a prefabricated tile material which in place is similar to a huge Swiss cheese, having 1-in. holes separated by ¼-in. walls extending vertically from top to bottom of the filter. The customary depth for both rock and tile is 6 ft., but different authorities advocate both shallower and deeper depths, and the available information on depths is not too conclusive. It is obvious that in the case of the tile filter, with its 1-in. vertical holes, the liquid must be sprayed on the top, using rain-like distribution and having the drops contact the holes at an angle in order to provide the minimum

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film of liquid on the surface of the flora. The use of a low capacity or high rate distributor will flood the holes, will prevent the creation of a thin film, and will result in poor treatment.

ANOTHER FORM of biological treatment is known as activated sludge. This method substitutes a tank full of sewage for the filter heretofore discussed. The function of this process is to maintain a tank full of sewage containing suspended organic material that floats in the liquid where the aerobic micro-organisms can attach to the particles and cause the necessary change. It is mandatory that these particles remain in suspension, do not settle, or rise to the surface. Changes in the chemical characteristics of the sewage will change the ability of the particles to remain in suspension. This method produces, in the case of domestic waste, probably the best of all treatment. The initial cost is about the same as high rate or high capacity filters, but the upkeep costs are higher and it is more susceptible to operational troubles than filters. This process also has its many variations. The original concept was based upon 6 to 8 hrs. of detention wherein the suspended material was either aerated by mechanical means or by the use of compressed air. Recent developments have successfully reduced the cost by, in one case, the use of 2½ hours of aeration and, in the other case, the maintaining of large numbers of activated sludge micro-organisms in a separate container and their use when needed. This latter method helps very materially in reducing the time of detention, with consequent economy.

The Guggenheim method of treatment is a combination of activated sludge and chemical treatment wherein the detention period is reduced to about 2 hrs. and iron, in the form of ferric chloride or ferric sulphate, is used as a catalyst. Under certain conditions this has been used quite successfully, particularly in the treatment of milk wastes.

In the choice of settling tanks, previously mentioned with the filters, there are three basic types: first, the rectangular tank wherein the sewage enters one end and flows to the other. The mechanism necessary to remove settlings and flotable material for this type of tank prevents the use of deep baffles with a consequent tendency of the liquid to follow the surface. This produces a high velocity in a shortened flow distance. The second type is a circular tank wherein the liquid is introduced through a circular center well, from which it flows toward the outside periphery. This type of tank has the disadvantage of requiring perfect placing of the weir at the outside circumference to prevent short circuiting and, under strong wind conditions, to blow the majority of the liquid to one side of the tank. This tank under correct operating conditions has excellent velocity control but short flow distance. The third type is the Spiraflo, which is a round tank having a baffle suspended near the periphery a few feet from the outside wall and extending downward about 9 ft. into the liquid. The incoming sewage is released on the outside circumference of the tank with a motion tangential to the circular baffle, eventually passing under the baffle and up to the center of the tank in a spiral path where it discharges over weirs. This appears to have good velocity control and a long flow distance.

Settling tanks are customarily designed to provide a specified period of detention or what is commonly called the ''rise.'' The rise is defined as the gallonage per square foot of tank surface per 24 hrs. and will vary from 600 to 1,500 depending upon conditions. For instance, a primary settling tank handling raw sewage and preceding a filter will have a much higher ''rise rate'' than the final settling tank following the filter, where the settleable solids are finer and require longer detention to settle out.

In terms of value received for dollar spent, the ideal settling tank would provide a quiescent period of maximum detention time, lowest velocity, maximum flow distance, minimum rate of flow over the discharge weir, and assurance of maintained conditions.

WHERE BIOLOGICAL treatment is not feasible, chemical treatment consisting of a mechanical quick mix, a flocculator, and a settling tank can be used. Under normal conditions this treatment has to be specific for the particular condition encountered and does not form any general pattern. For the reason that this is mechanical flocculation of the suspended material, the degree of removal will be limited by the contents of the liquids that are in solution.

Certain wastes, mostly from food canning processes generally seasonal in operation, have been treated in lagoons. A lagoon consists of a lake between 3 and 5 ft. deep as a customary depth and holds the waste for a complete season. The lagoon is generally emptied during the spring flush. In most cases sodium nitrate is added to satisfy the oxygen demands of the organic material, the nitrate changing to nitrite through oxidation of organic material and, by movement of the liquid in the lake, returning again to nitrate by obtaining oxygen from the air so that an economy in the cost of the chemical is obtained.

The lagoons for the treatment of food processing wastes are apparently being gradually superseded by the use of either furrow or overhead irrigation-type disposal. The furrow type consists of distributing the liquid over porous soil by means of furrows plowed in the ground surface.

Overhead irrigation, which is a more recent development than the furrow type and is becoming increasingly popular, consists in spraying the waste liquid over the ground. Movable, lightweight aluminum piping equipped with spray nozzles is employed. The ground used in this method has been successfully utilized to produce rather heavy crops of alfalfa and other types of hay in some cases. Either type of irrigation field, furrow or overhead, should be carefully operated to prevent soil saturation and subsequent undesirable runoff. Both methods require a porous soil condition and care in layout to take advantage of the topography. Enough area should be provided to permit frequent change in the ground being used.

A recent development, specifically for the treatment of milk wastes and particularly small cheese plants, is called the "Cavitator" method. Air is introduced into the bottom of a deep tank containing the liquid waste through the use of a rotor operating on a hollow shaft at a very high speed. The air is discharged into the liquid through the tips of the rotor by centrifugal force and supplied by the suction created in the hollow shaft. It is claimed that the speed of the rotor is such that actual cavitation occurs at the tips resulting in very fine air dispersal. This method apparently has a low initial cost and may have other applications beside its present use.

As previously mentioned, the Buswell process of anaerobic digestion consists in putting all the wastes, solids, and liquids in a sealed container and holding them from three to five days. This treatment was originally developed for the wastes from the distillery industry and is primarily designed for wastes having a strength of between 5,000 and 14,000 p.p.m. BOD. Fullen at the Hormel Packing Company at Austin, Minnesota, applied the same basic treatment to packing plant wastes and produced excellent treatment in a matter of about 10 hrs. This has been done only in pilot plant size units and not on full-size commercial plants.

Reference was made earlier to the different degrees of treatment and to the fact that certain processes furnished "partial" treatment, falling in the range between those classified as "primary" and "complete." Some of the aeration-flotation processes are of this nature.

Probably the two best known aeration-flotation processes are the Sveen-Pederson and the Bulkley-Dunton. In both cases air is introduced into the liquid waste, which is then pumped into a small tank under pressure, tending to dissolve the air into the liquid. Upon release from the pressure tank the liquid flows into a shallow open tank. The air forms fine bubbles upon release from pressure, carrying suspended and settleable material to the surface of the liquid where it is skimmed off. Original use of this process was developed for the paper industry about 20 years ago. In recent years growing use has been made of the process in the meat packing industry and elsewhere.

The Chain Belt Company has developed a similar process. The chief difference is that only a portion of recirculated liquid is aerated and pressurized and introduced into the open tank along with the raw waste. The Gibbs Process is somewhat similar except that small bubbles are introduced at the bottom of the open tank. In most cases, with any of the foregoing methods, some chemical application is used as an aid to flocculation. The type of chemical used varies with the characteristics of the waste and the water.

Thus far this article has been primarily concerned with the treatment of liquids and the removal of the solid matter from the liquid. Unfortunately, removing the solids from the liquid does not end the problem. Treatment of the solids is necessary to condition them so that they may be disposed of without creating a problem.

For years the more-or-less standard method of treatment of the solids has been anaerobic digestion. This consists of pumping the solids removed in the settling tanks to a large concrete tank called a digestor. The sludge as pumped from the settling tanks has a moisture content of approximately 96% to 97%. It remains in the digestor for a period of 30–45 days wherein it undergoes a process of digestion or ''rotting.'' The solid material is reduced through formation of gases and soluble material and is removed periodically for dewatering and ultimate disposal. The supernatant liquid resulting from this process is intermittently returned to the plant influent. The temperature of the material in the digestor is normally maintained between 90 and 95°F. either by fixed heating coils in the digestor of by circulating the sludge from the digestor through a heat exchanger. The digestor equipped with heating coils normally has a fixed cover or roof, and the contents of the digestor are continuously agitated by mechanical means. Where a heat exchanger is used, this agitation is usually accomplished by circulation of the sludge from the digestor through the heat exchanger and back to the digestor. This type of digestor is usually equipped with a floating cover. The gas formed in the digestion process is utilized as a fuel for heating the digestor and the treatment plant with provisions for auxiliary fuel supply of oil or gas.

The handling of the solids has always been one of the more difficult and expensive problems of waste treatment. In recent years research on this particular subject has been quite intense, and there have been a number of new developments which bear considerable promise. Some of these are still in the research stage, and some of them have now been in actual use in a number of installations.

What is known as the Chicago Pump Catalytic process has reduced the holding period for digestion to seven days. The process consists in removing and compressing the gas from the digestor and discharging it at the bottom of the digestor. This produces a relatively uniform agitation and mixing and is claimed to be the basic reason for the shortening of the holding time. This method does not create a supernatant; rather the entire contents are removed periodically to a settling tank for consolidation before dewatering. We understand that the sand beds used for dewatering are larger than customary with other processes. Another method of sludge treatment, the Torpey method, was developed at the Bowery Bay plant in New York. The sludge is thickened in a variation of the common type of settling tank. During 1952 the sludge averaged 11.2% solids compared to the 3% to 4% as the more common condition. Digestion is apparently not a function of the percentage of solids, and this produces material economy in initial cost when operation is done by using a high percentage of solids.

Sludge removed from a digestor requires dewatering for easy handling. The most common method of accomplishing this purpose is to discharge the sludge from the digestor onto sand beds wherein the liquid drains through the sand and is returned to the plant influent, leaving the solid material to dry on the surface of the sand beds.

Vacuum filters have also been used for dewatering digested sludge and raw sludge as well. The vacuum filter is a large drum covered with cloth or closely spaced steel wires rotating while partially immersed in a tank of sludge. A vacuum is created inside the drum, causing a layer of the sludge to adhere to the surface of the drum. The interior surface of the drum is subjected to pressure rather than vacuum through one segment of its rotational travel, thus loosening the sludge blanket for removal by conveyor. Various chemicals, such as ferric chloride and lime, are commonly used to condition the sludge and accelerate dewatering. The Twin City metropolitan sewage treatment plant has established a very fine record in dewatering raw sludge by using vacuum filtration, particularly in reducing the use of chemicals to a point where this cost is well below the average. The use of vacuum filters on digested sludge seems to have generally ceased. This trend is largely due to the cost of installing vacuum filters as compared to construction cost of the relatively simple sand beds.

The Laboon method of sludge handling, based on experimental work conducted in Pittsburgh, indicates that sludge stored in a quiescent stage for five days at a temperature of 93–95°F. will separate from the liquid. The sludge rises to the top of the tank, probably through the formation of gas to some extent, leaving a clear supernatant below. The supernatant can be returned to the plant influent, and it is claimed that this sludge can be readily dewatered on vacuum filters without the use of chemicals. We understand that a full scale installation of this type is now being made for the city of Pittsburgh.

In smaller treatment plants considerable success has resulted in the use of chemically treated raw sludge dewatered on sand beds. In this process the raw sludge is pumped about twice a day into a small tank. Anhydrous ferric chloride is added to give a concentration of around 2,000 p.p.m. based on wet weight. This will produce a pH of about 3.5 resulting in practical sterility of the sludge. The ferric chloride is mixed with the sludge, using a high speed quick-mix for a period of only 20 seconds or so. This apparently gives complete mixing and is not long enough to break down the floc. The wet sludge is then immediately drained onto sand bends where it will dry in a matter of hours to a point where it can be loaded onto trucks with a pitchfork. The dried sludge is commonly used as farm fertilizer on crops, such as corn and others, which are not normally eaten raw. This method requires that the sludge be removed from the plant about twice a week and has a higher labor and chemical cost than digestion but does have a much lower initial construction cost.

An entirely different method of sludge handling which has been in use in Germany for a number of years is now being introduced into this country. In this process the wet raw sludge of 3% to 4% solids content is placed in a relatively small tank where is undergoes a short period of high frequency, three-dimensional vibration. The apparent effect of this unit is to produce a sludge of such low moisture content that it will burn. The first unit of this type is presently being installed in the treatment plant at Green Bay, Wisconsin. It is claimed that this same general type of unit has successfully been used in Germany to process a whole waste as well as sludge and has produced an accelerated rate and high degree of settling.

IN THE FIELD of mechanical removal of such solids as wood pulp or paper fibers a new method developed by Yeomans Brothers Company is receiving considerable interest. This process employs the use of a paper filter supplied in roll form and supported on a metal screen belt forming a shallow basin. The liquid is discharged into this basin and passes on through, leaving the solid material deposited on the surface of the paper filter. As the paper becomes clogged with the particles, the resistance to the flow of the liquid passing through the paper increases and the head of water builds up. At the proper point this actuates a float control, which causes sufficient movement of the metal screen and paper roll to supply a new surface for use. The process is continuous. A wide variety of paper is available for different types of solids to be removed.

In the case of wastes that contain a material volume of sand or grit, a mechanism for the removal of this material is usually provided. This mechanism is basically a widening of the flow channel with a checking of the velocity of the flow below one foot per second, the grit being deposited in the channel and the organic material carrying on through. A mechanism is provided to scrape the bottom and remove deposited grit.

Where large materials such as rocks, pieces of wood, etc., are to be encountered in the liquid waste, it is customary to provide a bar screen. This consists of bars about 2 in. apart with a provision for removing deposited debris. The screen may be cleaned mechanically or manually.

Pumps used for pumping raw sewage are usually classed as trash or non-clog pumps and are specifically designed for the purpose of pumping sewage. Fairbanks, Morse and Company have an ''Impellorless'' pump, which is apparently quite successful under these conditions. Where sludge is to be pumped, it is customary to use a positive displacement plunger-type pump or what is known as a sludge pump.

The choice of processes should be determined by a careful study of the volume and characteristics of the waste to be treated. If the plant is to be biological, it is very important that the microbial feed be a balanced diet of carbohydrates and nitrogenous material. Wastes that are not normally readily susceptible to biological treatment are customarily removed by a process similar to flotation or other chemical process. It is obvious that where the food for microbial life is well balanced, the treatment will be better; and where the food is devoid of the necessary nutrients, then these must be added if the treatment is to function.

Milk, as an example, is an excellent microbial food but is extremely strong and tends to arrive in concentrated solution in short periods of time. The BOD of whole milk approximates 123,000. Blood, with a BOD of 200,000, is a good microbial food but has a tendency to go rapidly anaerobic. The vegetable canning wastes are not normally readily susceptible to aerobic biological treatment with the exception of peas, beans, tomatoes, and beets. Corn, potatoes, squash, pumpkin, etc., are normally treated by lagoon or irrigation methods.

We know of three treatment plants used for the treatment of vegetable oils: two Gibbs-type plants and one tile media filter using a low capacity distributor. The records on all three plants are not complete, but one of the Gibbs plants is supposed to be doing satisfactory work, and the other, a new installation of larger size, was not yet in proper operation at last report. The results from the tile media filter are both good and bad. It is to be noted that the use of a low capacity distributor on tile media is a basic violation of the theory concerning such use.

In the treatment of petroleum oils it is reported that this waste can be treated by a period of quiescence, a period of gentle agitation, and a period of quiescence again. In some cases bales of excelsior or straw have been placed in the flow line for the purpose of removing petroleum oils.

For wastes that tend to become anaerobic, are already anaerobic, or are to be treated in an aerobic biological treatment plant, the use of a pressure pre-aeration tank has certain value. This provides a method wherein the waste can be put in contact with air under any degree of pressure and will satisfy the immediate demand for oxygen and should produce saturation. This is a method of controlling odor and producing better treatment at a very low total cost.

Regarding the operation of biological treatment plants the troubles to be encountered are usually caused by failure to produce a uniform food condition at a relatively uniform temperature. There are certain cleaning solutions that are germicidal. The introduction of petroleum oils, gasolines, kerosenes, and excess grease will cause trouble. Wastes will vary with every community and every industry, and problems encountered will probably be peculiar to that particular condition. There is no way in which all of the complications can be allowed for.

With the exception of municipalities where the waste conditions are relatively common, the use of a pilot plant is usually a sound approach to the obtaining of a sound design. As mentioned before, an in-plant survey should be made, and the wastes studied from the point of view of composition, ability to remain uniform as to composition, temperatures, etc. From this study it is possible to set up a method of constructing either the pilot plant or a complete plant as the data would indicate.

It is strongly recommended that any form of primary or partial treatment should be designed and installed with eventual complete treatment in mind. In approving permits for construction of any type of treatment facilities, none of the pollution control agencies of the various states is granting approval which will be necessarily valid in the future. The lack of any uniform policy regulating the standards of treatment to be required, changes in waste conditions, the increasing interest in pollution control by conservation organizations, such as the Izaak Walton League, and many other factors enter into the picture. A decision as to the degree of treatment required for any specific case can be reversed or amended in a short time because of change in conditions. The only sound approach to the problem is to plan for complete treatment. Where only primary or partial treatment is then required and constructed, it could be considered as the first stage of the ultimate plant. If additional treatment is then required at a later date, there will be minimum loss of investment in original work.

It is my firm belief that more satisfactory public relations and lower over-all costs can be obtained if a standard of complete treatment is established for all wastes and if industry and municipalities are allowed to proceed with stage construction as their economic conditions may permit.

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Chinese Feast Marks NC Section's Fall Meeting

GUESTS OF HONOR, Raymond Eng and his wife Jan Eng, arranged an unusual Chinese feast for the fall meeting of the Northern California Section of the American Oil Chemists' Society on October 28, 1955, at the Tao Lee You restaurant in San Francisco. The menu included melon cup soup, chicken, lobster balls, Peking duck, broccoli with beef, spare ribs, and fried rice. Their host was W. C. Wood, Newport Soap Company, Oakland, Calif., who is chairman of the Section.

Mr. Wood reported on the technical papers and social activities of the 29th fall meeting of the Society, held in Philadelphia, October 10–12, 1955. John Wallace of the du Pont Company spoke on "Epoxidation and Epoxidized Oils."

As a result of the annual election, the 1956 chairman will be Albert Volkmuth of Best Foods, San Francisco. His elected committeemen, to be assigned "chores" later on, will be W. S. Belden, Producers Cotton Oil Company, Fresno; Ora L. King, King Oil Company, Richmond; and R. H. Purdy, Pacific Vegetable Oil Corporation, Richmond.

Door prizes were donated by Curtis and Tompkins Ltd., Best Foods, Norda Essential Oil, Braun-Knecht-Heiman, Fritzsche Bros., Newport Soap Company, and George Leuders Company.

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Ault Is Elected to A. C. S. Office

Waldo C. Ault, head of the animal fats section of the Eastern Utilization Research Branch, Philadelphia, Pa., has been named chairman-elect of the Philadelphia section of the American Chemical Society and will assume office on January 1, 1956. The Philadelphia section, fourth largest section of the A.C.S., has approximately 3,200 members.

Dr. Ault, an associate editor of the Journal, served as chairman of the program committee for the 1955 Philadelphia fall meeting of the A.O.C.S.

Publishes C.S.M.A. Proceedings

Proceedings of the 41st mid-year meeting of the Chemical Specialties Manufacturers Association, held at Chicago, Ill., in May, has been published in a 216-page spiral-bound booklet. Copies are available from the association secretary, H. W. Hamilton, 50 East 41st street, New York 17, N. Y., and are priced at $7.50 in the United States, $8 outside the continental U. S.

Offers Brochures on New Books

Elsevier Press Inc., 2330 Holcombe boulevard, Houston 25, Tex., has made available a 52-page brochure describing Elsevier's Encyclopaedia of Organic Chemistry. Fourteen volumes of the encyclopaedia are now published.

Elsevier Press also offers a 30-page catalog listing their scientific and technical publications and an eight-page brochure describing their Chemistry of Carbon Compounds series.