Analytical Chemistry Is Important to the Growth of Purex

Entrance and Library at Purex Technical Center

PUREX CORPORATION has become a diversified international corporation with five operating groups. Its more than one thousand products include bleaches, toilet soaps, household and industrial detergents, and specialty cleaning compounds, floor waxes and finishes, drug and cosmetic products, paints and paint vehicles, paint strippers, various types of protective coatings, etchants and protective coatings for chemical milling, polymer emulsions and specialty resins, dye penetrant flaw-detection systems, plastic forming operations, ultrasonic cleaning devices, etc. These many and varied products call for numerous analyses and frequently the analyst must use great ingenuity to develop suitable analytical processes for some of these complex mixtures.

Corporate management, recognizing and appreciating the substantial contribution which analytical chemistry has made to the growth of Purex, has provided superior research facilities to service all operating groups by building a Technical Center at Wilmington, Calif. Analytical chemistry was one of the principal factors which influenced the decision to centralize the corporation's chemical research and development at this new facility. The cost of maintaining six small research laboratories at as many locations was becoming inordinately high, largely because of the need for library facilities and costly analytical chemical instrumentation at each of these laboratories. Management, therefore, decided to relocate all chemical research at a single place with one library and one analytical laboratory servicing all groups. This makes it possible to provide better library and analytical services for the money spent.

The Technical Center was built at Wilmington, since this was the site of the Corporation's most up-to-date and largest facility, the former Turco Products Laboratory. Also, adequate land, already owned by Purex, was available at this location. Two modern research buildings with a total floor space of 30,000 square feet were in operation at Wilmington. These buildings were tied together by a new three-level structure of 53,000 square feet floor space, giving a combined area of 83,000 square feet in the Technical Center.

The new building is rectangular in shape with a central utility core running the length of the building. Laboratories are laid out on a 10′ × 30′ modular basis on both sides of this utility corridor. All hood vents, gas, water, air, electricity, nitrogen, steam, etc., are brought in through the utility corridor, providing low cost maintenance and ready modification of facilities to meet changing needs of the various laboratories. Offices are located around the perimeter of the building with halls between the offices and laboratories.

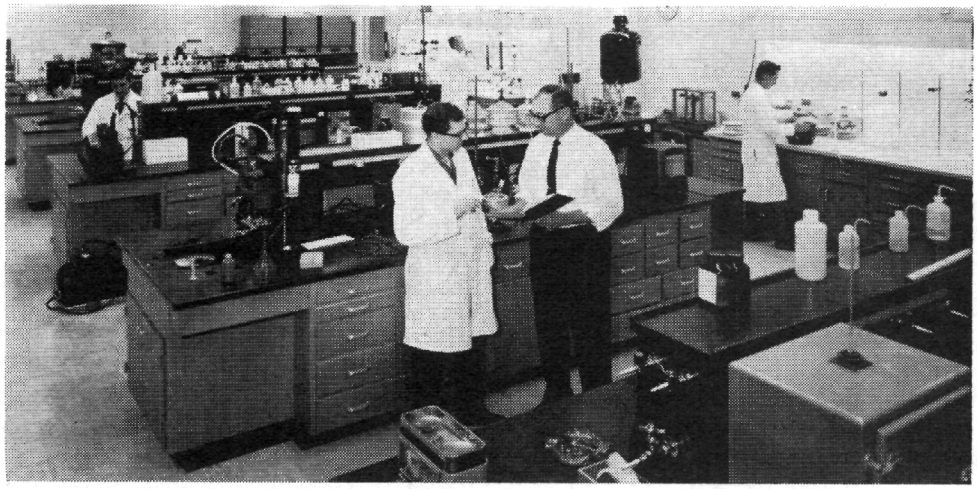
Hoods are located at the end of each laboratory adjacent to the utility corridor to minimize duct-work connecting with that in the utility corridor. The hoods have a unique design developed by Purex. Although the hoods are relatively low in cost, their new design makes possible certain performance and operating advantages. The saving in cost in air-conditioning and heating capacity more than paid for the total cost of the hoods! The new Purex hood draws 60–80% of its air from the utility corridor, which is not air-conditioned. (In the Southern California climate no heating or cooling of this air is required. In a more severe climate, a minimum heating would be required during the very cold months.) The remaining 40–20% of the air is drawn from the laboratory, and is, therefore, air-conditioned air.

The analytical work is about equally divided between organic and inorganic determinations. Many of the mixtures analyzed contain from six to twenty components, partly organic and partly inorganic. These mixtures must be

separated by suitable techniques and the various components determined quantitatively. Extensive use is made of ion exchange, gas chromatography, infrared, visible, and ultraviolet spectrometry, as well as volumetric and gravimetric methods in these analyses.

There also are specialized analytical techniques which must be used in connection with certain processes or products. The Lawrence hydrogen detection gage is used to evaluate the possibility of hydrogen embrittlement from all cleaning, paint stripping, protective coating, or other products which are used on aircraft structural parts. Bleaching and soil removal studies have been made using radioactive isotopes as tracers and conventional counting equipment for quantitatively measuring soil removal. Our surface coating and polymer laboratories use light scattering techniques for molecular weight determinations and particle size distribution measurements. The dye penetrant and flaw detection system laboratories use optical methods in both the visible and ultraviolet regions for analyzing the results of their operations. The Chem-Mill section has special methods for evaluating maskants and etchants.

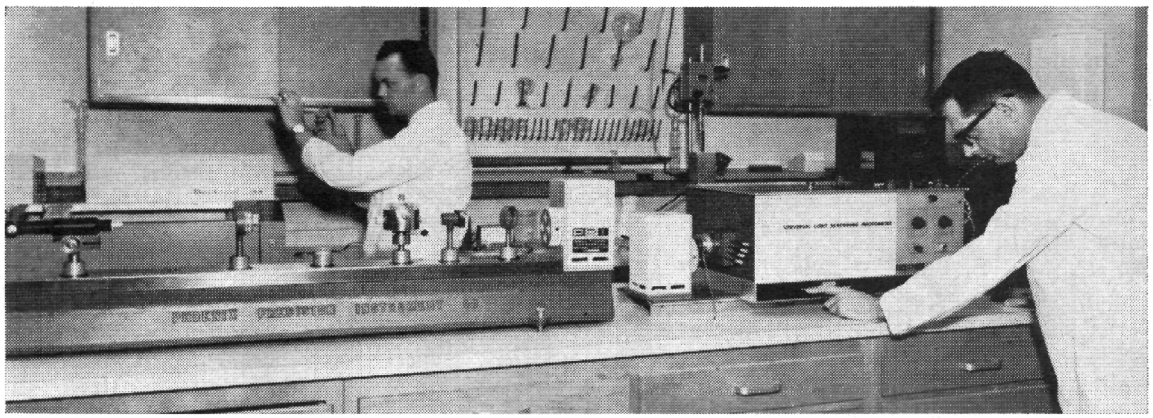
While none of the apparatus or techniques are particularly unique, they are representative of modern analytical methods requiring skill and knowledge on the part of the analyst. The significant factor to the analytical chemist is that the Purex Technical Center has provided greatly improved library and research facilities.



General Analytical Laboratory showing special titration benches in background

Purex evaluates the performance of its household detergents, abrasive cleansers, hypochlorite and peroxide bleaches, janitorial maintenance products, etc., by studying the quantity of a standard "soil" removed from cloth swatches, painted panels, floor tiles, vitreous enameled surfaces, etc., by reflectance measurements, fluorescent emission studies, and radioactive tracers using the illustrated equipment

LABORATORY OF THE MONTH



The performance of various polymeric lattices of polystyrene, polyethylene, polyacrylics depends among other things upon the molecular weight of the polymer and its distribution in addition to the particle size of these polymer particles in the emulsion. The light scattering photometer and differential refractometer are used in these analyses of particle size distribution and molecular weight distribution

Purex blows their own plastic bottles and vacuum forms some of their other plastic containers. Thread form on the neck of bottles and wall thickness at various points are critical for the good performance of such containers. These characteristics are analyzed at frequent intervals by use of an optical comparator

The infrared and near-infrared spectrophotometers and gas-liquid chromatographs are the work horses of the Analytical Laboratory. These are used to separate, identify, and quantitatively determine many of the organic components of surfactant, polymer, perfume, floor wax, dye penetrant, protective coating, and other complex organic mixtures normally a part of Purex business

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Purex uses the Lawrence hydrogen detection gage to detect possible hydrogen embrittlement resulting from the use of alkaline or acid paint strippers, alkaline detergents and other industrial cleaning compounds used in cleaning and refinishing the exterior surfaces of aircraft or other equipment where this could be a possible problem. This analysis requires the determination of hydrogen in the parts per million range in the metal under consideration