billion gal in 1990, not the 10 billion gal the Department of Energy has set as an objective. "And," he says, "unless specific steps are taken to ensure a market, it is doubtful that annual production will reach even 1.5 billion gal by 1990."

He bases his lower estimate of U.S. production potential on fermentation of grain only. Alternate cellulose conversion technology will be well developed in the late 1980's, he says, but may not be economically viable. To reach even 4 billion to 5 billion gal in 1990, Rains says industry needs dependable raw materials sources with stable prices, proven or well-demonstrated technologies, and dependable markets.

Grain supplies and prices could be stabilized over the long term by financially sound firms able to contract for large supplies. He points out that corn price increases of recent weeks would have raised ethanol prices 20 cents per gal. Many fermentation processes proposed have not been demonstrated. The Energy Security Act guarantees prices and markets for gasohol (a mixture of 90% gasoline and 10% ethanol) for government use, but Rains says this is only 1% of U.S. needs.

By 1990, Rains estimates that refinery gate gasoline prices might be $3.00 per gal. At that time, because of tax credits, companies with integrated, 10 million to 100 million gal-per-year plants might sell ethanol at $2.90 per gal with nearly $1.00-per-gal pretax profit. By contrast, farmers with 100,000 gal-per-year plants might need $3.50 per gal just to break even. "A large number of companies are going to make a lot of money making fuel ethanol," according to Rains, but "a lot of people are going to lose a lot of money by entering into poorly conceived ventures." □

Goodyear develops PCB removal method

Technology to remove residual polychlorinated biphenyls (PCB's) from specialty industrial oils has been developed by Goodyear Tire & Rubber Co., Akron, Ohio. The method may be useful in treating other toxic chemicals such as pesticides. Goodyear will put the process in the public domain without seeking financial gain.

"We filed for a patent for defensive purposes to prevent someone else from profiting on this," says Dane K. Parker, the Goodyear scientist who invented the technique. "The patent will go into the public domain. Even if the patent is not granted, the company will donate the information to the public. The decision was made at the highest levels that we aren't going to traffic in someone else's misery to make a profit."

Goodyear's version of the technology is aimed specifically at removing PCB contamination at levels of several parts per million from heat transfer, hydraulic, capacitor, and transformer fluids. Contamination arises when users drain PCB's from systems and replace them with other fluids. The Environmental Protection Agency has established 50 ppm as the limit on PCB contents of enclosed systems.

Parker adds the calculated amount of sodium in 1-lb blocks to a portion of contaminated oil in a stirred autoclave reactor at 150° C under a nitrogen blanket. The oil in these experiments is a partially hydrogenated terphenyl. Cooling the reactor to 30° to 40° C with vigorous stirring produces sodium shot. He then adds naphthalene in tetrahydrofuran (THF). Greenish-black sodium naphthalide precipitates at once and dissolves to a homogeneous solution after one to four hours' stirring.

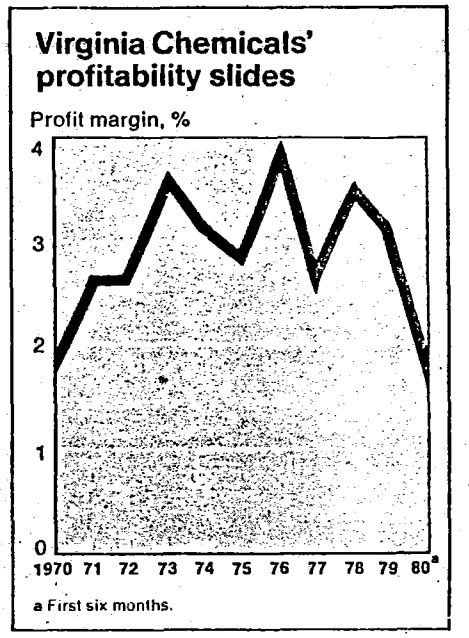
Parker pumps the solution under nitrogen pressure into 5000 gal of contaminated oil in a storage tank. The reaction decreases PCB levels to less than 10 ppm after two hours. He quenches the reaction with water and distills the oil, after collecting a forerun of THF and naphthalene. PCB's form a low-molecular weight polyphenylene and sodium chloride.

Parker estimates the cost of decontamination at 30 cents per gal of oil, which has a value of $10 to $12 per gal. He points out the process can be carried out at a plant site with no transportation costs, using relatively unsophisticated equipment. The technique can be adapted to higher concentrations of chlorinated compounds, says Parker, but additional equipment then may be required to remove the heat of reaction. The method uses a 50- to 100-times molar excess of sodium naphthalide to decontaminate functional fluids, but this is still a small amount of reagent, because PCB levels are only several hundred parts per million. □

Celanese to acquire Virginia Chemicals

Celanese Corp. and Virginia Chemicals last week agreed in principle to a merger of Virginia into a subsidiary of Celanese.

Under the terms of the agreement, Virginia Chemicals stockholders will have the option of receiving 0.475 share of Celanese common stock or $26 in cash for each share of Virginia Chemicals stock held. However, Celanese will not be required to pay cash for more than 30% of the outstanding shares of Virginia Chemicals. Celanese expects the merger to constitute a tax-free exchange for Virginia Chemicals stockholders who receive only Celanese common stock. The value of the deal is about $67 million.



Virginia Chemicals had sales in 1979 of $131 million and earnings of $4.2 million. In the first half of 1980, sales were $78 million, an increase of 17% over first-half 1979. Profits, however, were a different story. Net earnings at Virginia Chemicals dropped 59% to $1.5 million from first-half 1979.

Sales and profits at Virginia Chemicals have grown nicely in the past decade, although profit margins have been below the average for the chemical industry. Between 1969 and 1979, compounded sales growth averaged 15.4% per year and profits increased an average of 9.5% annually. For the past five years, sales have grown at a slower rate of 13.7% annually, but profits have been increasing faster. Earnings between 1974 and 1979 rose at an annual average rate of 13.8%.

Virginia Chemicals is the largest U.S. producer of sodium hydrosulfite. It also manufactures alkylamines and products for refrigeration and air conditioning. About 20% of its sales are overseas.

Celanese says that as yet no timetable has been set for the completion of the acquisition, since it will depend on government filings and approvals. The deal also depends on the conclusion of a definitive agreement and needs the approval of Virginia Chemicals stockholders. □

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