EASTMAN TO MAKE CHEMICALS FROM COAL

The long-studied plunge of the U.S. chemical industry into coal as a raw material is now reality. Eastman Kodak is the pioneer, converting coal to synthesis gas and then to chemicals.

Tennessee Eastman, an operating unit of Eastman Kodak's chemical division, this year will begin construction of a plant to make acetic anhydride from coal, slated to go on stream in 1983 in Kingsport, Tenn. The firm declines to tell either the capacity or cost of the plant.

Industry observers say the new plant is designed to stem the rise of ethylene consumption within Eastman Kodak, which has outstripped the almost 1.3 billion lb-per-year capacity of its Longview, Tex., plant and forced the company to become a net buyer of increasingly higher-priced ethylene.

"To our knowledge, Eastman will be the first manufacturer in the United States to commercially produce a new generation of industrial chemicals from coal," says Toy F. Reid, executive vice president of Eastman Kodak and general manager of the Eastman chemical division.

One unit of the new plant will gasify coal to carbon monoxide and hydrogen. Another unit will convert sulfur, separated from this synthesis gas, to sulfuric acid. Hydrogenation of carbon monoxide will produce methanol in a third unit. A fourth unit will esterify methanol with acetic acid, recovered from acetylation of cellulose with acetic anhydride. Reaction of methyl acetate with carbon monoxide will produce acetic anhydride in a fifth unit.

Also planned for the acetic anhydride complex is a coal-fired steam plant for cogeneration of steam and electric power, which will start up in 1982. On completion of the acetic anhydride and steam plants, coal consumption at Kingsport will rise to 6000 tons per day, compared with 4400 tons now.

Reid says that costs of the acetic anhydride and steam plants will take "a substantial proportion" of the Eastman chemical division capital budgets for 1980–83. The 1980 capital budget is $210 million, compared with $184 million in 1979.

Eastman uses acetic anhydride to make cellulose acetate for photographic film base, fibers, plastics, and a wide range of other chemical products, according to Tennessee Eastman president Robert C. Hart. "We make and use about a billion pounds of this product each year. When the new facilities are put into operation, we will reduce the level of operations of the present process for manufacturing acetic anhydride," he says.

Reid: first one in the U.S.

The firm currently pyrolyzes acetic acid to ketene, which reacts with recovered acetic acid to yield acetic anhydride. New acetic acid for this process comes from oxidation of acetaldehyde, which is produced mostly by oxidation of ethylene.

In addition to avoiding use of ethylene, Eastman spokesmen say that the new acetic anhydride process eliminates energy-intensive burning of oil and natural gas. Oil and gas provide process heat for acetic acid pyrolysis in the old process. Texas Eastman will continue to make acetaldehyde at the company's 500 million lb-per-year Longview plant as a building block for other chemicals produced there.

It would take a lot of end-product acetic anhydride in the coal-based complex at Kingsport to make much of a dent in Eastman's ethylene use. For example, if Eastman wanted to reduce ethylene use 200 million lb per year, capacity of the new acetic anhydride plant would have to be 730 million lb per year.

The company will get its coal gasification technology on license from Texaco Development Corp. Bechtel will design the coal gasification and steam plants. Construction contractors will be selected later this year. Eastman will use its own technology for other units of the planned complex.

Also at Kingsport, in separate capital projects, Tennessee Eastman will begin expansions of polyester prepolymers and diketene capacities and continue expansions of cellulose acetate cigarette filter tow and polyethylene terephthalate (PET) bottle resin production. At other Eastman companies, parts of the $210 million capital budget will go to complete oxo chemical expansions by Texas Eastman, Longview, Tex.; to improve and expand polyester resin facilities at Carolina Eastman, Columbia, S.C.; and to continue expansion of capacities for unspecified organic chemicals at the Batesville, Ark., location of Arkansas Eastman. □

Laetrile put back on clinical test track

After a delay of more than one year, the Food & Drug Administration has given a tentative nod to the National Cancer Institute's proposal to test Laetrile clinically.

In the autumn of 1978, NCI director Arthur C. Upton (who recently left the institute) announced that he had decided to seek FDA permission for a clinical trial of the controversial substance, which is derived from apricot pits and allegedly is effective in treating cancer (C&EN, Oct. 2, 1978, page 4). Because Donald Kennedy, who then was FDA commissioner, had been an outspoken critic and skeptic regarding Laetrile, many observers expected him to block such a trial. And, indeed, no investigational new drug application issued while Kennedy remained at FDA.

Now, with Upton and Kennedy both out of the picture and back in academic positions, FDA is flashing an amber light on the proposed Laetrile test. Before Laetrile can be administered to cancer patients, however, it must undergo an animal-toxicity test. "If the test shows that the

samples [of Laetrile] are safe in animals, FDA has stated that NCI would have permission to begin studies with human cancer patients," NCI says in an official statement.

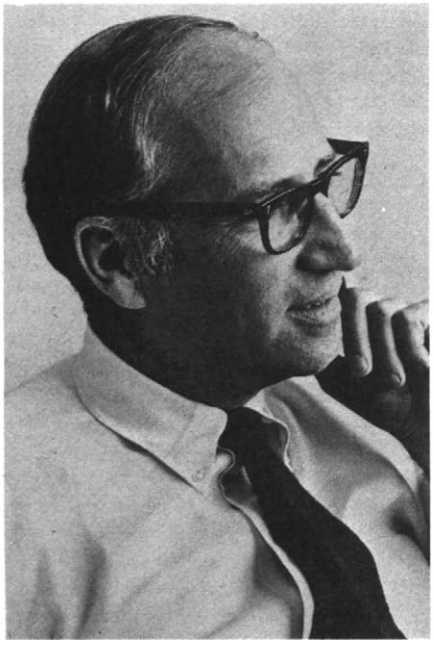
In fact, NCI has agreed to one further pharmacologic study before a full-scale clinical trial can begin. The study, which will begin if the toxicity results are satisfactory, will "assure that unacceptably high levels of cyanide do not occur" in patients taking the recommended Laetrile regimen.

Though FDA and NCI officials seem less than convinced of Laetrile's alleged effectiveness, clinical trials could begin by spring—delayed but apparently not scuttled by behind-the-scenes activity at FDA. □

Scientists forecast advances for 1980's

Physics will experience a developing "spectroscopy of quarks and leptons." Cosmology could face a radical rethinking of how the universe works. And in between these microcosms and macrocosms, chemistry will be moving rapidly toward a much greater understanding of the temporal behavior of chemical reactions.

These are several views of what's in store for science in the next decade. The task of predicting was undertaken by scientists in various disciplines last week in San Francisco at the annual meeting of the American Association for the Advancement of Science. The occasion was a symposium "Science and *Science:* The Next Decade," celebrating the centennial of the AAAS weekly magazine *Science.*



Koshland: progress in biochemistry

Peering ahead in chemistry, George C. Pimentel, deputy director of the National Science Foundation, notes that despite all that is known about reaction behavior, understanding of it is rather shallow. But with the new tools at chemists' disposal—computers and lasers, for example—Pimentel expects extremely rapid development of the field over the next decade.

Specifically, Pimentel cites five sometimes overlapping areas. One area of "very, very active research" is in energy movement within and between molecules. Other areas include weak interactions, local environments of molecules, and chemistry at interfaces.

In addition, he says that state-to-state chemistry is "perhaps one of the most glamorous areas at the frontiers of chemistry." In the coming years, Pimentel says, it will be possible to prepare molecules in particular energy states and study their reaction kinetics. This likely would lead to the ability to predict product energy states.

Five areas in biochemistry that will see rapid advances were cited by Daniel E. Koshland Jr., professor of biochemistry at the University of California, Berkeley. Cell differentiation and energy-yielding biochemical systems are two of the areas. On the question of cell-to-cell signaling, Koshland says that coordination of the signals coursing through the blood will be one of the big developments in the next 10 years.

A fourth area, neurobiology, is on the verge of a very exciting period, Koshland says. And in the field of growth and cancer, the whole study of uncontrolled growth will go through a major development.

Physicists, meanwhile, will be focusing on the spectroscopy of quarks and leptons, according to Sydney D. Drell, deputy director of the Stanford Linear Accelerator Center. Experimentally, physicists will begin to answer such questions as: How many quarks are there? Do quarks have internal structure or are they really pointlike, as currently theorized? Are there more generations of leptons and quarks than have so far been determined?

In cosmology, says Geoffrey R. Burbidge, director of Kitt Peak National Observatory, in Tucson, the hot, big bang picture of the universe will be pushed ahead a little further in the next 10 years. But he notes a number of problems in the picture—for example, there are objects that appear to be associated in space but that have widely different red shifts, indicating that they are at greatly different distances.

Pimentel: strides in reaction behavior

Something very strange is going on, Burbidge says. "And what is going on we don't understand, and have no theory to understand it." Burbidge thus feels that cosmology could undergo a radical rethinking on the universe in the coming decade. □

Effect of export ban to Soviets not clear

President Carter has acted to tighten his curb on the export of high-technology items to the U.S.S.R. by suspending all existing export licenses and freezing all currently contracted shipments.

Although, according to the White House, chemical technology is included in the ban, along with computers, microprocessing and communications equipment, oil and gas equipment, and metallurgical technology, it is not yet clear what effect the ban will have on the chemical industry.

The National Security Council has exempted specifically from the export ban Occidental Petroleum's contract, under which it will ship 1 million tons of superphosphoric acid per year to the Soviet Union in return for 1.4 million tons per year of ammonia.

Producers of fertilizers and agricultural chemicals still are digesting the news of the partial embargo on grain shipments to the U.S.S.R. For the most part, they won't even speculate on what is going to happen next.

W. R. Grace & Co., for example, has no comment at all. American Cyanamid says it is studying the situation, adding that "so much depends on what the government does." Monsanto says that although the embargo