

required data from the companies themselves rather than doing its own testing, and that provisions to monitor the safety of the protein after commercial startup were scanty. Analysis of the n-paraffins proposed for use showed a content of less than 1 ppb each of polycyclic aromatics (such as 3,4-benzopyrene) that are known carcinogens. But the opposition wasn't convinced that safety from long-term accumulation of such impurities had been demonstrated.

The four-year single-cell protein evaluation project that began last spring commits five institutes within the Ministry of Agriculture to working out criteria and methods to monitor the safety of feedstuffs using the protein. "No country," points out Dr. Ki-yoshi Katoh of the ministry's National Food Research Institute, "has yet fully developed such a monitoring system." On the administrative side, he adds, the ministry is drawing up legislative amendments giving it stronger powers to inspect feeds and feed additives and the ability to halt production if required. By 1978, it's clear, the government hopes to restore Japanese public confidence in the value and safety of the protein through more comprehensive regulations and, not least, by visibly assuming responsibility in this area. Even so, the consensus is that single-cell protein animal feeds made from n-paraffins are out of the question for now in Japan, and the leading firms in development of the protein aren't even considering using it in products for human consumption in the near term.

Methanol and ethanol don't suffer from the image of contamination that oil and paraffins bear in the minds of some Japanese. But there are technical reasons as well for the present concentration of development effort on such substrates. "n-Paraffins were really first-generation substrates," says microbiologist Yasuo Kurimura, who is senior coordinator of Mitsui Toatsu Chemicals' research and planning department. "Interest in Japan started shifting about five years ago to short-chain compounds like methanol and ethanol." Among their technical attractions were miscibility with water and—because of their oxygen content—smaller oxygen consumption and heat release during fermentation. Mitsui Toatsu began work more than a year ago with both methanol and ethanol as substrates for yeast growth. Like Mitsubishi Petrochemical, the firm started with a search for high-temperature yeasts. "We've got a good 37° C strain," notes Kurimura. Mitsui Toatsu hasn't reached pilot plant stage but can produce kilogram quantities of yeast for testing.

Perhaps farthest along in pilot-scale work in Japan is Mitsubishi Gas Chemical Co., which completed a 500 metric-ton-a-year unit in July. Methanol is the substrate, and bacteria, rather

than yeast, the product. Yields so far of dry cell mass are about 48%, based on methanol consumed.

Minimum economic size of a commercial single-cell protein plant, say development managers, is about 100,000 metric tons a year. There seems to be plenty of room in Japan's potential market. Japanese output of formulated feeds last year, Kurimura points out, was 18 million metric tons, of which about 90% was imported material, such as corn and milo. For nutritional balance, single-cell protein content of animal feeds is limited to 5 or 10%. Thus potential Japanese demand is almost 1 million metric tons of the protein now, and Kurimura expects it to double by 1985.

Michael K. McAbee, C&EN Tokyo

OECD weighs PCB pollution problems

International economic aspects of environmental pollution control was the theme of a two-day meeting in Paris last month attended by ministers and key officials responsible for environmental matters in the 24 member countries of the Organization for Economic Cooperation & Development. Ten action proposals that will now go before the individual governments for adoption were agreed to.

The proposals center on the "polluter pays" principle, transfrontier pollution, measures required for further air pollution control, strategies for the control of specific water pollutants, water eutrophication control, environmental effects of chemicals, energy and the environment, analysis of the environmental consequences of significant public and private projects, noise prevention and abatement, and traffic limitation and low-cost improvement of the urban environment.

Norway's environment minister, Dr. Gro Harlem Brundtland, who chaired the meeting, points out that the fact that the conference took place at all is significant "at a time when some people felt that we should stop worrying about the environment because of the immediate energy situation." Environmental problems "will continue to be a major challenge to governments for the foreseeable future, calling for coordinated national policies and concerted international actions," she says.

More than 200 delegates attended the conference. These represented the 24 OECD member countries—Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the U.K., and the U.S. In addition, delegates came from Yugoslavia, an affiliate member, and from the European Economic Community, as well as ob-

servers from the Council of Europe, the Economic Commission for Europe, the UN Environment Program, the European Free Trade Association, and from the OECD's secretariat.

The concept of the polluter paying isn't new. Indeed, it was generally agreed to at an OECD council meeting two years ago which member government ministers attended. It has important implications for international trade and investment. Disputations could arise if some governments provide grants to industrial operations toward cleaning up their pollutants while other governments do not, since the principle hinges on the cost of pollution control measures being reflected in the ultimate cost of goods or services.

Attendees at last month's Paris meeting agreed that OECD countries will continue to work closely together in striving for uniform observance of the polluter pays principle. They also recommended adoption of more stringent standards to limit the occurrence and scope of state aid to polluting operations.

The subject of transfrontier pollution took the longest time to thrash out because, as Brundtland points out, it entails some conflict with the principle of national sovereignty.

The conferees didn't discuss specific existing incidences of transfrontier pollution, such as the problems faced by countries served by the Rhine River or the increasing acidification of Scandinavian waterways that, some experts contend, is a direct consequence of sulfur-laden particles being swept by winds northward from the industrial centers of Europe. Nevertheless, they maintain that the principles agreed to should help develop harmonious environmental policies with a view to ultimately solving such transfrontier pollution problems. Countries are encouraged to enter into bi- and multilateral abatement agreements and to jointly set up monitoring networks.

"Good neighborliness" and a fair balance of rights and obligations among the countries concerned are at the heart of the nine-point recommended code of conduct drawn up. For example, countries are urged to refrain from embarking on projects that might create significant risk of transfrontier pollution before first providing infor-

Brundtland: coordinated policies needed



mation at an early date to other countries likely to be affected. Too, transfrontier pollution levels shouldn't exceed those deemed acceptable within the country where the pollution originates. And under an "equal right of hearing" principle, a mechanism should be set up that would allow those affected by transfrontier pollution to avail themselves of the pollution country's judicial or administrative procedures to the same extent as those living in that country.

A recommendation that directly concerns the chemical industry centers on the desirability of establishing the potential environmental effects of existing products and of those that haven't yet come on the market. Japan, Sweden, and Switzerland already have introduced legislation requiring premarket testing of chemicals. And most OECD member states demand safety assessments on pharmaceuticals, food additives, pesticides, and the like. That international accord on the limitation of use of hazardous chemicals is possible goes back to February of last year, when the OECD countries agreed to control production and trade of polychlorinated biphenyls because of their toxic and teratogenic effects.

The OECD environment committee would like to see more agreement and collaboration among member countries on chemical assessment programs. "Clearly, mutual acceptance between member countries of the results of national assessments would ensure proper control without unnecessary impediments to trade and industrial development in the countries directly involved, or proliferation of hazardous products into other countries," the committee report states. Such mutual acceptance also would facilitate international exchange of data, thereby contributing to economic efficiency.

The committee admits that putting large numbers of chemicals through a variety of tests as an additional phase in the regular market development process would place additional demands on technical as well as financial resources. "It is important that full-scale testing be applied selectively," the report continues.

Dermot A. O'Sullivan, C&EN London

Exxon high on chemicals outlook

Despite the general downward trend of most economic indicators, Exxon Chemical president Donald O. Swan is bullish about the future of his company and of the petrochemical industry generally. His attitude stems from three interlinking premises. Technological advantages make most petrochemical products "quite resistant" to general economic slowdowns, he maintains, and resilient to price rises. Growth in demand for petrochemicals, too, will exceed overall

economic growth rates by a good margin. Equally important, in his view, the industry should be able to obtain adequate supplies of fuel and feedstocks. "Looking ahead, we think that the industry is in for some good years, although we may see a pause in sales growth in 1975," he predicts.

Speaking at a Brussels, Belgium, meeting of Essochem Europe's top managers, Swan pointed out that his company is backing this spirit of confidence with a commitment of more than \$300 million for new plants in Western Europe. The outlay ranks among the biggest single investment decisions Exxon Chemical has taken at any one time over the past 50 years or so. Most of the capital will go toward expanding Essochem's naphtha-cracking operation at Cologne, West Germany, from its current annual ethylene capacity of 120,000 metric tons to 450,000 metric tons and for building a 220,000 metric-ton-per-year low-density polyethylene plant at Meerhout-Vorst, Belgium.

Ted Innes, Essochem Europe's president, notes that "completion of these two projects [by the end of 1976] will not only strengthen our position as a major European olefins producer, but should also enable us to become an increasingly significant factor in the European plastics market." Other projects include a 50% expansion of the company's methyl ethyl ketone plant at Fawley, England, which now can produce about 40,000 metric tons a year, and a 100,000 metric-ton-per-year solvent plant at Treccate, near Milan, Italy.

With the biggest chunk (44%) of its business in Western Europe, Swan expects Exxon Chemical "will rank among the top 15 worldwide chemical companies in sales this year and probably among the top 10 in profits." The company already is among the two or three largest producers anywhere of olefins, specialty rubbers, additives, and solvents, he notes, as well as an important supplier of aromatics, nitrogen fertilizers, vinyl intermediates, and polyolefin resins.

During the first nine months this year revenue from Exxon's worldwide chemical operations totaled \$2.4 billion. This compares with revenues of \$1.8 billion during the whole of 1973, when earnings of \$202 million represented a 14% return on total assets, Swan contends, though, that the figure now should be "about 17% because of the higher costs all round." In terms of tonnage output, this year will show an 8% improvement over last year, which in turn was up 13% from 1972.

But things haven't always been smooth sailing for Exxon Chemical. "We made some horrible mistakes," Swan admits. A variety of factors prompted management's decision to get out of the fertilizer business, although the company is still a major producer of ammonia and related nitrogen products, with plants in Canada, Greece, Malaysia, the Netherlands, and Pakistan. The



Swan: some good years ahead

company also backed away from synthetic fibers, which, according to Swan, "would have called for about half a billion dollars to be plowed into the basica before we got going." All told, Exxon Chemical has divested itself of some \$500 million of regional investments during the past six years or so, leaving it with total net assets of \$1.3 billion at the end of last year.

Swan attributes the easing in petrochemical sales growth expected in the immediate future to customers' cutting back on their inventories. "The high financial cost of carrying inventories is a consideration," he points out. More important is customers' lessening concern that shortages of raw materials will interrupt their operations.

Although he admits that "in the near term we are likely to see some over-supply develop in the U.S. and Europe in some product areas, capacity utilization will average out at very high rates over the next five years. Our studies in many different markets support this conclusion." Indeed, if his reading of the situation is right, a severe olefins shortage is developing. "The European ethylene market may be about six steam crackers short by 1980," he says, "even after adding the 10 new ones now planned." In the next five years, he forecasts an annual need for six 450,000 metric-ton-per-year (of ethylene) naphtha crackers worldwide, three in Western Europe, two in the U.S., and one elsewhere. "We have always tended to underestimate the rate of growth in the plastics industry," he adds. "Today, it is growing more rapidly than was estimated five years ago."

As for the likelihood of the oil producing countries in the Middle East becoming producers of basic petrochemicals, Swan admits that eventually there will be a number of chemical operations there, but he does not foresee this as a significant development for a decade or so. "There are some built-in negatives," he points out. For one thing, the technical difficulties of building and operating sophisticated plants there "are tremendous." For another, the Middle East is a long way from large markets. Besides, he maintains, growth of the world chemical industry will be such that "middle-eastern developments shouldn't have any significant impact for at least 10 years."

Energy council grapples with R&D priorities

Industry, university, and federal agency people worried about how well energy R&D will fare in next year's federal budget got an inkling—but not much more out of what may have been the final meeting of the government's Energy R&D Advisory Council last month. In short, the council urged a continued push and increased funding of all energy R&D programs supported by the federal government, but it appeared to endorse a more cautious pace for the liquid-metal fast breeder reactor and laser fusion programs. Overall federal funding for energy R&D has increased from \$909 million in fiscal year 1974 to \$2.04 billion in fiscal 1975.

On the agenda for the day-long meeting, which was well attended by press, public, and lobbyists, were a report by a fusion energy working group and discussions on setting up the new Energy Research & Development Administration, energy R&D priorities, and a solar energy resolution.

R&D priorities got the most attention. After all, in a letter to council members, Dr. Paul P. Craig, deputy director of the National Science Foundation's Office of Energy R&D Policy, noted that the meeting "will be the only opportunity the council will have to aid in the establishment of fiscal 1976 energy R&D priorities." How well the council capitalized on that opportunity is debatable, but at least the important people at the White House Office of Management and Budget responsible for deciding on funding levels for energy R&D programs were there—and taking notes.

In general, the council by a count of hands came out in favor of a strong R&D effort on conservation, oil, gas, shale, coal, environmental control, fusion, and solar energy. Generally, the idea is that energy programs ought to be limited more by manpower and technological development rather than by money. Specific recommendations included a "greater effort" on coal, particularly mining technology, more research on the safety and environmental effects of nuclear power reactors, and an "orderly unfrenzied program" for fusion. Further, although many council members didn't seem at all happy with either the pace of development or the sharply escalating costs of the LMFBR, they generally agreed that it should be continued. Last year the committee had backed the LMFBR.

William T. McCormack and J. A. Walker from OMB sought the council's

advice—but got little on anticipated ERDA management issues, such as to what extent ERDA should build up in-house technical capability where relatively little now exists, the appropriate government management role in cooperative R&D projects with industry, and the extent to which National Aeronautics & Space Administration and Department of Defense project management tools can be used on energy R&D projects.

McCormack also noted that patent provisions, particularly those dealing with mandatory and background licensing requirements, seem to be the biggest hangup to a conference committee in resolving the differences between nonnuclear energy R&D bills passed by the Senate (S. 1283) and the House (H.R. 13565).

And there was more than a little grousing among council members about the current state of affairs in the federal energy establishment. One committee member complained, with nodding approval from several others, about the "need for scenarios of energy

policy [before there can be a] sensible approach to problems of R&D spending." Others warned of an "impending disaster" and that not to concentrate on short-term fuels is "irresponsible." Several members urged that "fusion not be overfed" with federal money because too high a funding level "may delay it by overcommitting to hardware." Still others urged more effort on conservation and on upgrading technology for improving oil and gas production from existing wells.

How much useful information the OMB people got out of the council meeting that will be of help in deciding federal R&D priorities and funding levels or whether the council will ever meet again is far from clear. NSF director, Presidential science adviser, and council chairman H. Guyford Stever had opened the meeting with the caveat that the session be looked upon as "a last meeting" pending some further direction from the White House now that ERDA is being set up. "We have done our part," Stever said.

Fred H. Zerfel, C&EN Washington

EPA's Office of R&D criticized again

The Environmental Protection Agency's Office of Research & Development is again on the firing line. Sharply criticized in a National Research Council report early this fall for serious deficiencies in its management procedures, the R&D office now is under attack by the Senate Subcommittee on Environmental Pollution. The subcommittee recently completed an overview inquiry into the office's staffing and organization, and the effectiveness of its planning procedures.

A final report prepared by the subcommittee staff finds that the "dominant theme in the conduct of R&D in EPA is highly centralized headquarters control and a complex and burdensome planning and reporting system. Specific problem areas identified in the report include "basic inadequacies in establishing environmental strategy and research priorities to meet legislative mandates, a highly centralized and overly complex research planning and management system, [too] large a



headquarters staff to operate planning and management systems, instances of low morale among key field scientific staff, and administrative activities that duplicate agencywide . . . functions."

The central problem, the report says, is a "distortion of the original line authority and the original staff authority in the R&D office." The present management system "has been designed to expand [headquarters] control from just the oversight function to also gain access to the day-to-day operational level in the field." As a result, the report finds, there is an "exaggerated overcontrol by headquarters of field research"; delegation of authority to the field is "minimal and mostly cosmetic."

This close headquarter control encourages an elaborate paperwork system "designed to maintain headquarters awareness of R&D needs, progress, problems, and data." According to the report, this system "generates several thousand documents each year that consume vital R&D office expertise to originate, to review, to respond to, and to maintain an historical file." As a result, the report estimates that paperwork, aside from that needed for productive planning, consumes about 25% of field R&D staff time.

Aside from deficiencies in the R&D office's management system, several other factors are of concern to the subcommittee staff. One is the long-term trend in EPA funding of the office. The report notes that although total funding has held at a constant range, the portion devoted to technological development has been constantly decreasing. The report questions whether EPA will be able to meet its legislative mandates, which require a scientific and technological data base, if this trend continues. Another area of concern is resignations and shortages in scientific manpower in the field laboratories. This has resulted, the report says, in appointments of nonscientific personnel to some positions, and less qualified personnel to others.

The report concludes with several recommendations for possible R&D office action: that the planning system and headquarters staff be simplified; that plans be oriented toward meeting legislative mandates; that reorganization to a minimum staff in headquarters and a maximum staff in the field be carried out; and that unnecessarily duplicative programs be terminated.

Although an EPA spokesman says that the R&D office recognizes its problems and is trying to correct them, reorganization efforts have been hindered by lack of direction. The office of EPA assistant administrator for R&D has been vacant since last May when Dr. Stanley M. Greenfield resigned. However, this situation may soon be remedied. On Nov. 27 President Ford nominated Dr. Wilson K. Talley to fill the post. Talley, a physicist, is currently study director of the Commission on Critical Choices for Americans.

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