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SOME ASPECTS OF PLANNING FPC PRODUCTION FACILITIES [1]

by

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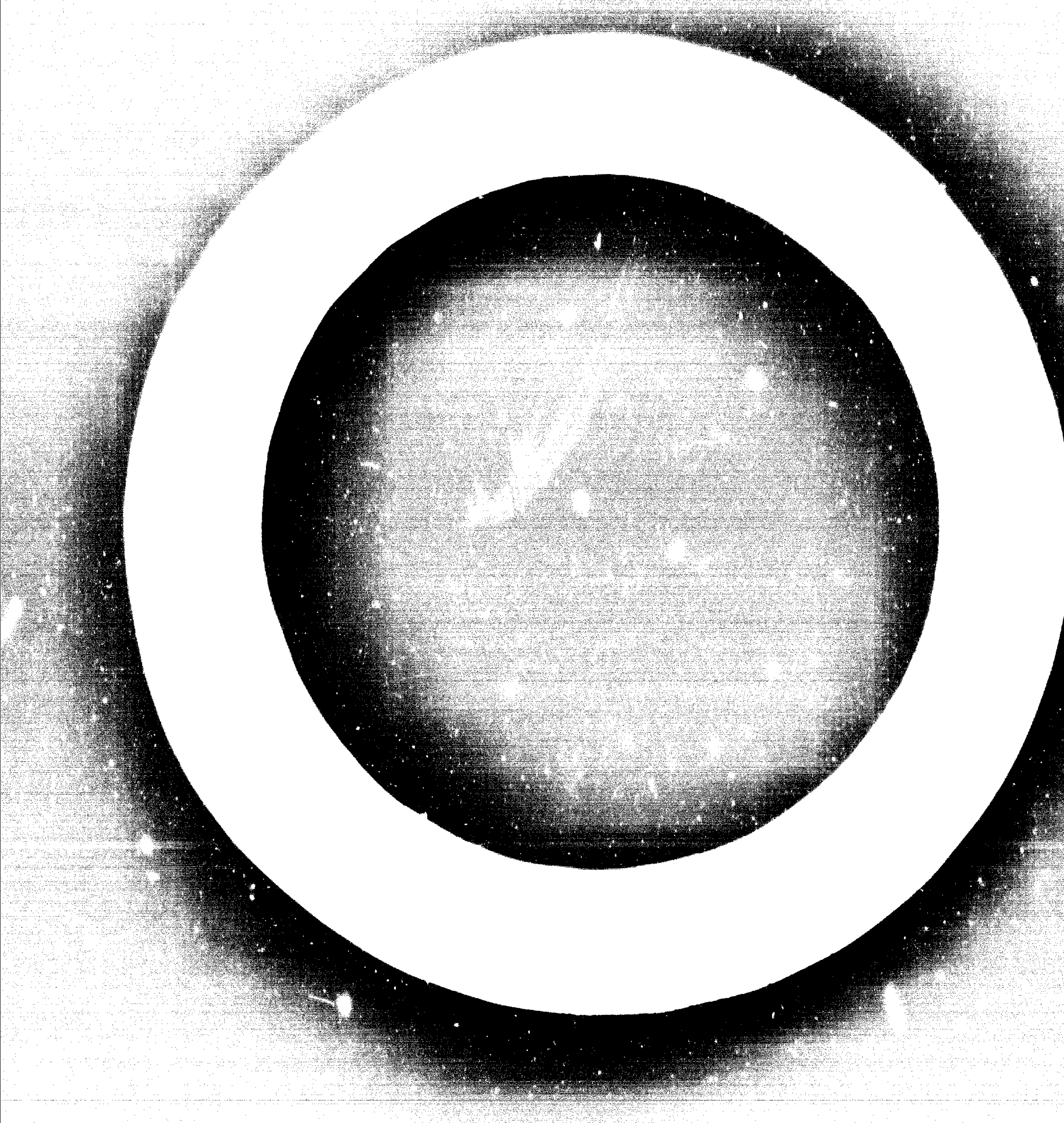

SUMMARY

In the planning of FPC plants, basic objectives must be clearly defined. These will differ in each case and include the provision of raw materials, the specification of the product in relation to market requirements, cost factors and the disposal of by-products.

The isopropanol extraction process can already be supplied on a commercial scale with a good deal of flexibility to meet the specific requirements of individual projects. Examples of adaptable process features include raw material storage, bone removal, extraction techniques, FPC grinding and deodorization.

Some of the points I should like to make have already been touched upon. Nevertheless, my experience to date with pre-engineering, feasibility studies and suchlike, suggests that they must be put into perspective and emphasized. They are not directed at the Agadir project specifically, but concern FPC projects in general.

Before we design an FPC plant, even the basic process system, I believe we must clearly define what we wish to achieve. I therefore propose to run through a few basic considerations on which the location, size and process of an FPC plant must depend. Subsequently, I will briefly mention some features of the isopropanol extraction process which have already been developed with a degree of flexibility that will permit us to cope with varying requirements in respect of product characteristics, integration with the fishing system and local circumstances. Many of the questions one should raise at the inception of an FPC project may call for lengthy and difficult studies.

A satisfactory supply of raw materials represents perhaps the most important key to the commercial success of an FPC plant. Not only must such a project be based on adequate fish resources without danger of depletion, but we must also have developed suitable harvesting techniques. The project should be supported by a fishing management with the necessary fleet at its disposal to provide the plant with landings of the desired quality and quantity, and on a manageable schedule. The location of the plant, its capacity, the methods of fish handling and storage, the size of storage facilities and, indeed, the process route itself must all be chosen in the light of what fish supplies can be expected. Otherwise, we may end up with a plant that is doomed to erratic and uneconomical operation.

My next point concerns the nature of the product itself. Different markets and applications will call for varying product characteristics in respect of mineral content, particle size analysis, trace components, solubility, dispersing power, heat coagulating ability, flavour, colour, etc. For each particular project, we must therefore define where the FPC is to be marketed and for which major applications, and what requirements the purchasers and public health authorities will lay down. Only then, can we determine the appropriate range of product specifications and design our plant accordingly, as far as possible at the prevailing state of the art. Without this line of approach, we can easily fall for a process route which may handicap the utilization of the product. One can argue that we should make a good product in the simplest possible manner without concern for functional and other properties, and leave it to the purchaser and his experience with formulations to make the best possible us of it. Yet the technology has already advanced to a point where we can begin, even on a commercial scale, to vary and control certain properties of the FPC. I am not suggesting, of course, any compromise on product quality.

Notwithstanding the above considerations, the process and the degree of complexity of the equipment can, within limits, be adapted to suit the manufacturing cost which the market can tolerate and which the cost of the raw materials will permit. For example, we can sacrifice flexibility for the sake of simplicity, and strike an appropriate balance between mechanization, automation and labour. Many figures have been quoted in recent months and years, and at this Meeting, on the capital cost of FPC plants and on production costs. It is not surprising that they differ widely as they depend on numerous factors, which relate perhaps more to specific circumstances surrounding a particular scheme than to the materials and energy requirements inherent in the chosen process. The largest item in the production cost of FPC is, of course, the raw material, but adaptable features such as storage of materials, material handling, solvent turnover, sanitation, pollution control, processing of by-products and construction, to mention only a few, can have far reaching effects on the overall economics. One should not, therefore, attach undue significance to figures that are not adequately substantiated or draw conslusions from figures before satisfying oneself that they are really applicable.

The manufacture of FPC can yield a number of by-products such as fish oil, fish meal, bone meal, solubles, etc. In laying down the basic design criteria for an FPC plant, we must come to a clear understanding as to the effluents involved, and how the facilities to process them profitably can best be integrated with the FPC process proper.

For example, and this came up recently, let us say we are interested in storing raw fish in refrigerated sea water to cope with fluctuations in the supply of raw materials and to take advantage of this method of storage in subsequent process steps. The used water would contain organic material. If pollution control regulations prevented the disposal of contaminated water, if treatment facilities were too costly or if there was no outlet for the recovered material, this apparently insignificant obstacle would call for a major revision of the proposed process route.

The foregoing remarks illustrate the futility of attempting to develop a single process, let alone a plant design, for universal use. This does not mean, of course, that the results of development work in Agadir or elsewhere cannot form the basis for numerous future FPC plants. Rather, the rapidly growing scientific and technological knowledge of FPC already permits us to adapt a plant to some extent to specific circumstances. This flexibility will increase over the years as a variety of processes currently being developed reach commercial applicability. I would add that these processes are not necessarily competitive, as they aim at products with widely differing properties.

The most developed processes are based on solvent extraction and a number of them, such as those developed by the Bureau of Commercial Fisheries in the U.S.A., the Fisheries Research Board of Canada, the Viobin Corporation and others can now be applied on a commercial scale.

The isopropanol extraction process seems to be of particular interest to this Meeting, as it has been chosen at Agadir for a number of current projects and as approval by the Food and Drug Administration in the United States is subject to at least a final isopropanol wash. As you have heard, the Food and Drug Directorate in Canada is expected to follow suit shortly on the basis of two applications submitted quite recently, one covering a wide range of species. We have already heard ample evidence that we are sure this technique can produce FPC of the highest quality on a commercial scale. I would, therefore, like to refer to it to illustrate that we have already achieved a measure of flexibility to meet varying circumstances. The only plants of this type now in operation are a few pilot plants and a commercial plant for making a feed grade product from fish meal. However, my company has completed the basic process design for the first commercial facility at Canso in Canada and we are certain, on the strength of numerous pilot plant and equipment tests, that no insurmountable process problems will be encountered.

For example, evidence now exists on how long and under what conditions we can store fish and intermediate materials without refrigeration in the solvent. This means that we can build plants to cope with specific fish landing schedules, and even consider shipment of intermediate materials to a centrally located extraction plant.

Extraction need not necessarily begin with the raw fish. Depending on the circumstances surrounding the project, extraction may be preceded by mechanical removal of the bone or by cooking and removal of oil and solubles by conventional means, as is the practice at Agadir. Incidentally, we should not conclude that this procedure is always more economical than direct extraction.

The extraction procedure itself offers a high degree of flexibility in respect of the number of extraction stages, process conditions, contacting and separation techniques, etc. The design can thus be adapted to suit different starting materials and to arrive at products of the most exacting specifications.

A variety of techniques have been explored for final grinding and classification of the FPC. These differ widely in performance and cost. They may also serve to effect partial removal of bone unless this has already been accomplished earlier in the process. The partial or complete removal of bone not only limits the fluoride content of the product to meet the requirements of public health authorities, but also opens the door to a wider range of applications. Here again, we have an opportunity to tailor the process to meet specific requirements.

Deodorization of the solvent before it is recycled can be expensive. We are no longer afraid of this problem, but must wait for the results of a fully continuous operation to determine just how far we need to go to arrive at a truly odourless product. One or a combination of three methods may be employed, namely acid treatment, fractional distillation and adsorption. Odor compounds can also be removed elsewhere in the process, namely by pH control during extraction and by steam stripping during desolventising of the FPC. The effects and economics of all these steps are interrelated and also dependent on other process variables. The complexity of the desolventising system must therefore be related to the process as a whole as well as to the proposed applications of the product.

The above remarks are intended to stimulate discussion, to illustrate how much knowledge we already have for commercial application, and to suggest that we should remain flexible and not develop a concept of an FPC plant that is restricted in usefulness by premature detail. For this reason, I would rather not present data of flowsheets, material balances or energy balances at this stage. I shall, however, be pleased to contribute engineering details to any specific project as and when required.