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September 12, 1958

PRELIMINARY REPORT

This report was prepared only for use within General Electric Company in the course of work under Atomic Energy Commission Contract W-31-109-Eng-52. Any views or opinions expressed in the report are those of the author only.

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FINAL REPORT - IP-153-I
HAGAN COAGULANT AID AS A SUBSTITUTE FOR SEPARAN

INTRODUCTION

The demand for filtered water will be increased when I and E slugs are charged into the reactors. Some of the filter plants are near their ultimate capacity. One of the quickest ways of obtaining increased amounts of filtered water for production use is to restore to normal process service certain filters which are now isolated for exclusive drinking water use. These drinking water filters are isolated because the process water filters are being treated with Separan, a material which has not been approved for use in drinking water. A suitable approved substitute material was found and tested in the model filter at B Area. A full scale plant test was run at F Area for the purpose of confirming the results obtained in the model filter plant. The results of the full scale test are presented in this report.

SUMMARY

The 100-F Area Filter Plant operated successfully with Hagan Coagulant Aid instead of Separan during the difficult water treatment season (April-July). There were no undesirable effects in the water plant or in the reactor.

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SUMMARY (Continued)

The required feed of Hagan material was about 50 per cent higher than the feed required when Separan was used. The increase in cost caused by using the Hagan material is estimated at \$1,200 a year for F Area. This small increase in cost is easily justified because of the increased production made possible by the increased filter plant flow.

The Hagan material can be used with profit at B, D, and F Areas. Total flow increase resulting from the substitution of this material for Separan will be approximately 10,000 GPM. In the remaining areas, either drinking water is not supplied from the process water system, or the capacity of the filter plants is sufficient to make the use of the Hagan material unnecessary.

It is possible that Separan will eventually be approved for use in treating drinking water. If this happens it will be unnecessary to feed the Hagan material in any of the areas.

DISCUSSION

Test Procedure

In April, Separan feed was discontinued at the 183-F Filter Plant and Hagan Coagulant Feed was started. Routine data on consumption of chemicals, length of filter runs, amount of water treated, quality of filtered water, and general feed characteristics were taken. In-pile effects were also obtained. Film formation rates were noted from the standard deviation data sheets which are used for routine control of film growth. Corrosion data were obtained by N. R. Miller. Radiation data were obtained from the routine water samples and rear face measurements.

The test continued until July, when the water became so easy to treat that no Hagan material (or Separan) was required.

Water Plant Results

Table I shows the significant water plant data for the test period. The 183-B Area is compared with the 183-F Area because the two filter plants are essentially identical except that F fed the Hagan material and B fed Separan.

TABLE I
COMPARISON BETWEEN SEPARAN AND HAGAN COAGULANT AID

	<u>100-F AREA HAGAN MATERIAL</u>	<u>100-B AREA SEPARAN</u>
Filtered Water Turbidity - PPM	.007	.007
Filter Runs - Hours	8.5	9.0
Alum Feed - PPM	8.5	8.3
Hagan or Separan Feed - PPM	.026	.017

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Water Plant Results (Continued)

It will be noted that the filtered water turbidity was the same for B and F Areas. The filter runs and alum feed were essentially equal at B and F. The filter conditioner feed was 50 per cent higher at F than at B. It is concluded that the Hagan material and Separan are equivalent except in amounts of feed and cost.

The Hagan material is a granular solid which dissolves slowly to form a viscous water clear solution. It was found that vigorous agitation for one to two hours was necessary to complete the dissolving operation.

The Hagan solution is more viscous than a Separan solution of comparable concentration. For this reason it was necessary to make minor adjustments to the feed equipment.

Cost of the Hagan Material

The cost of the Hagan material is approximately \$1.25 per pound. The cost of Separan is about \$1.15 a pound. However, the test showed that approximately 1-1/2 pounds of Hagan material were needed to replace one (1) pound of Separan. Yearly consumption of Separan at B Area is about 1,600 pounds, which cost \$1,800. Estimated consumption of Hagan material based on the test data is 2,400 pounds, which costs \$3,000. The net increase in cost is \$1,200.

The Hagan material can be applied at B, D, and F Areas to increase the filtered water capacity by about 10,000 GPM. This increased flow of water is expected to make possible a production increase worth over \$1,000,000 per year. Annual increase in operating costs caused by the Hagan material is expected to be about \$4,000 (total for B, D, and F). There is no other known way of getting comparable increases in water flow or production for such a small cost.

Separan Approval For Use In Drinking Water

There is still a chance that Separan will be approved for use in treating drinking water by the Spring of 1959. If Separan is approved it will not be necessary to feed the Hagan material and approximately \$4,000 will be saved. Lifetime studies of laboratory animals which have been fed with Separan have been requested by the Health Officials before approval is considered. These studies are expected to be complete in February, 1959. General opinion is that approval of Separan for use in drinking water will probably be obtained within one to three years. Approval is a matter of considerable value and concern to the Dow Chemical Company so that the program to get approval is being expedited.

A reasonable program on our part is to be prepared to feed either material depending on circumstances which we can not now predict. Fortunately, changes to the equipment to accommodate either material can be made in about four hours.

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In-Pile Effects

The rate of film growth on reactor tubes and slugs was essentially zero during the period of the test. These data show that the Hagan material is equal to Separan as measured by the effect of the treated water on film growth within the reactor tubes.

During the test period there was a reduction in the radioactivity of the effluent water and of the rear face of the reactor. However, this kind of change has been observed before at various reactors, although there were no known changes in water treatment. It is concluded that the change in radioactivity is probably within the range of normal variation.

The test did not cause any change in the corrosion rate of aluminum as determined by examination of process tubes from F Reactor¹.

It is concluded that the Hagan material is a suitable material for use in treating water intended for process use. Approvals from Federal, State, and Company Officials have also been obtained to use the material in treating water to be used for human consumption.

W. R. Conley
Engineer

PROCESS TECHNOLOGY OPERATION

WRC/blh

¹Personal communication from N. R. Miller on September 9, 1958.

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