PRESENT AND FUTURE WATER CONVERSION PLANTS THEIR OPERATION AND DESIGN

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All of man's endeavor begins with a concept. This is the initial design of thought but, in itself, incomplete. From concept to effective and efficient execution is an arduous road whereby theory alone will not suffice. The practical realities and the multifarious involvements which this entails, are the forces which must act directly on the concept to bring its potentiality to fruition.

Also, here at Roswell, a grand plan has been conceived and constructed by capable engineers, and our organization has been called to the task of managing this fine facility efficiently.

It was suggested to me that we outline briefly the problems and the important aspects of this assignment. Our task is threefold:

First, to manage and operate the installed equipment in the most orderly fashion, and produce potable water at design conditions in respect to quality and quantity;

Second, to determine whether improvements in the design of such types of plants could be suggested; and

Thirdly, to investigate and to try out various operating methods which might reduce operating costs, increase the quality of the water, or the output of the plant without increasing investments.

A well-organized operation will be achieved by careful selection of personnel, which must be intelligent, resourceful, and accurate. Instruction and schooling for the personnel will be conducted by the two managing engineers--Dr. Charles W. Deane, a highly qualified doctor of chemical engineering (and co-author of this paper), and Mr. Anthony Pascale, an experienced professional mechanical engineer.

Exact schedules for taking water samples for laboratory investigation will be set up, and the chemical tests which we have evolved will be carried out in the plant laboratory. Equipment maintenance schedules will be established. All the work

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will be recorded and instruction books--based on actual operating experience--will be prepared. These books will describe the duties of each of the various operators, and will supplement the available fine instruction manual. These new instruction booklets will be written after sufficient experience in the operation of this new plant has been obtained.

During the first six to nine months, the greatest effort, however, will be concentrated on establishing practical operating schedules, and producing water of high quality and of a quantity commensurate with the plans of the designers.

Should it be found that certain small changes in design or construction are needed in order to obtain a uniform and satisfactory output, they will be reported and probably be immediately carried out., Generally, minor alterations are expected in a plant of this type.

Insight into the reliability of the equipment will be gained, and conclusions and recommendations for improvement in the design of future plants will therefore be forthcoming.

After a standard operation has been established for a few months, the field operation will be free to try out new techniques which should lead to cost reduction, increased output, maintaining at the same time, the quality of the water.

This we hope to achieve by:

1. Change in Operation of the Pre-Purification System

Deposit which is precipitated out may adhere to the walls of the equipment in the form of scale. In order to avoid scale formation, $CaSO_4$, in the form of a very fine powder, is introduced and circulated so that the precipitate may deposit on the particles and not on the walls. The so-increased slurry particles are then drained off. In this way, reduction in the cost of chemicals and equipment will be obtained. It may also be proven in this way that future plants can operate with a pre-purification system of reduced size, and using smaller amounts of the costly ion exchange resins, or eliminating it completely.

2. Drop-Wise Condensation

A second area of improvement may be found in the promotion of drop-wise condensation within our large evaporators. There are certain fatty substances which, when introduced in minor quantities into the water, provide a drop-wise, instead of a film type, of condensation. Experiments are currently under way at Franklin Institute on the use of sulfide films of copper and silver. Drop-wise condensation provides an appreciably higher rate of heat transfer and, in this way, should increase the output of the evaporators, or effectively reduce power consumption per gallon of water.

Other operating methods may also be tried, but it is perhaps a little too early to speak of the various ideas which have been developed by our staff.

In concluding, I would like to say a few words about the future of this type of plant, and how considerable reduction in the cost of producing potable water could be achieved.

There are several avenues of thought which may be pursued in order to reduce the cost of the end product. Here is a drawing which incorporates our thinking along these lines. The different methods which may be followed can be categorized as follows:

1. Increasing the Size of the Plant by increasing the plant to outputs of 25, 50, or 100 million gallons per day, considerable operating and investment savings can be derived.

2. Combining Different Types of Design in One Plant in combination with electrical power production would achieve considerable savings.

3. Figure 1 shows how a vapor compression plant could be combined with a long-tube, or flash-type evaporator plant, whereby the power plant which is installed within the compound, would furnish power to the vapor compressing plant, and recover the waste heat by the flash evaporator plant. Power production in combination with the two different types of plant would decrease the cost of the utilities and product water considerably.

4. Finally, the recovery and utilization of the wealth of chemicals contained in the saline water would be a most valuable avenue and, in pursuing this thought, it may be most practical in the first instance to think of the production of chlorine and caustic. These raw materials can be gained, by means of electric power, from a concentrated brine which otherwise has to be disposed of. For instance, at the Roswell plant, the brine disposal requires three large 30-acre ponds.

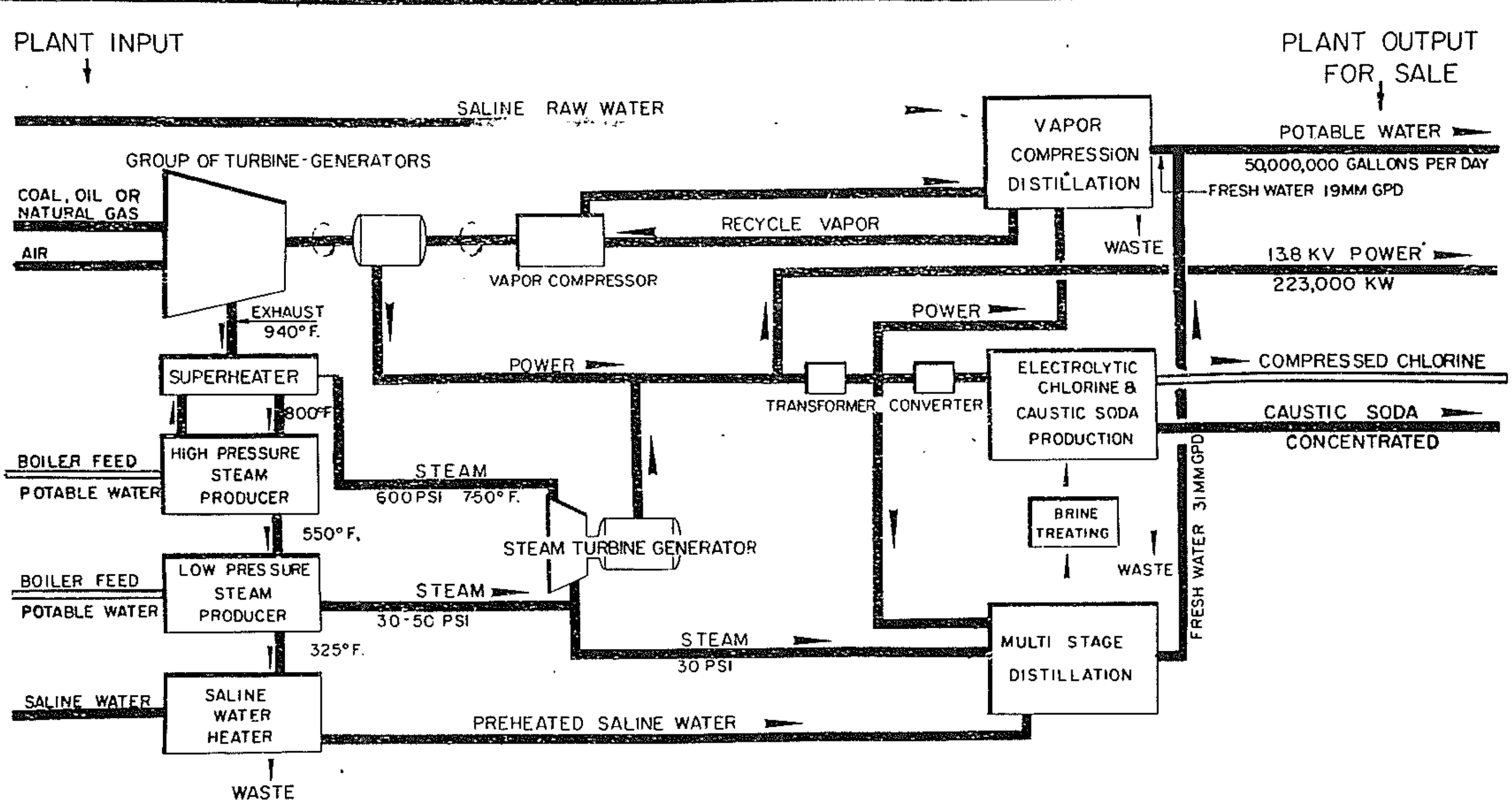
A considerable amount of electricity is needed for these plants. This has to be available at low cost. The economical production of electricity is certainly possible if the fuel is low-priced and, at the same time, the waste heat is economically utilized. Fortunately, most areas which have arid conditions, have gas or oil fuel available at relatively low cost. Therefore, in most cases, the production cost of heat for power production and evaporation purposes is relatively low.

Figure 1 illustrates such a plant, where the water production cost, we predict, can certainly be achieved at 30 cents per 1,000 gallons, or below.

<u>This we consider a future potential for our potable water plant</u>.

FUTURE SEA WATER CONVERSION PLANT

PRODUCING POTABLE WATER, ELECTRIC POWER, AND CHEMICALS



PLANT CAN BE SET UP IN ONE OR 3 TO 5 STEPS.

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AMERICAN HYDROTHERM CORP. ENGINEERS 10-55 JACKSON AVE. L. I. C. 1, N. Y.	PRELIMINARY FEASIBILITY STUDY OUTLINE FLOW DIAGRAM FOR 50,000,000 GPD POTABLE WATER	DWG. NO. B- FIGURE 1