

PROJECT DESIGN CONCEPT

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Summary

A good organizational set-up is necessary for the design phase of the desalination project. The work can either be the responsibility of the user's own design team or can be entrusted to consultants with requisite expertise in the desalination field. If the job is assigned to consultants, a good communication set-up is needed to transfer or receive information between the user and the consultant. The essential inputs needed for the design phase are site data, seawater data, economic parameters, type of desalination plant (single or dual purpose) and the number of units required to build up the overall plant capacity. Life expectancy of plant must be decided in the design phase as this parameter will dictate the type of material of construction needed for the plant and the capital investment required.

Depending upon the type of desalination process used for setting up the desalination plant, a list should be prepared indicating the user's technical requirements. The designers/consultants will prepare the necessary design report which should include various process flowsheets, material and energy balance diagrams, piping layout, drawings showing equipment layouts and fabrication details, complete specifications for the materials of construction and codes/standards to be followed for the fabrication/purchase of various equipment and materials. Technical details prepared in this way should be adequate to estimate the budgetary requirement and corresponding time schedule.

1. Introduction

During the techno-economic assessment of the desalination project, the need for setting up the plant and its techno-economic viability is established on the basis of preliminary and generalized concepts of various plant designs. In the design phase of the project, complete details of the process parameters, mechanical design of the equipment, details of electrical and civil works, equipment layout, process control and instrumentation requirements and other engineering details are worked out and frozen. Technical specifications for the plant equipment and material are also prepared. All these details are necessary to arrive at the precise capital investment and water production costs. Also for contracting the execution of the project and for assessment of the completion period of the project, all the above details are essential.

2. Organizational Set Up for Project Design Phase

The design work of the desalination project can either be carried out by the user's design team or can be entrusted to consultants specializing in the design of desalination plants. When the owner sets up his own design group for the work, the responsibility for the timely completion of design phase will be with the owner. Therefore, it implies that the owner has qualified engineers in the field, adequate communication facilities, secretarial staff and a good project house for the desired progress of the project.

When consultants are appointed to carry out project design work, due consideration should be given by the owner to technical competence and adequacy of engineering manpower of the consultants at the time of appointment. Day-to-day communication between the user's staff and consultants is essential to minimize delays in the time for completion of the design work.

3. Time Schedule

A project monitoring team must be appointed by the owner to monitor the progress of the work periodically and to prepare progress reports. The reports should be thoroughly discussed by the owner and the consultants. Bar charts/PERT charts should be reviewed periodically and corrective actions for keeping the project design on schedule should be identified and intimated to the various members of the design team. A number of modern computer softwares are available today for monitoring engineering projects. Use of such computer software will greatly help in quickly deciding and implementing corrective actions to avoid delay in the completion of the project design work.

4. Input Information Needed During Design Phase

4.1. Site Data

The following site details should be made available from the assessment phase; otherwise the design team must obtain such information from the concerned agencies responsible for maintaining site data records.

- (i) Geological and seismological characteristics.

- (ii) Height above mean sea level.
- (iii) Excavation characteristics of the soil.
- (iv) Load bearing capacity of the soil.
- (v) Distance from seashore to design seawater intake and outfall systems and pumping power requirement for seawater intake and discharge.
- (vi) High tide and low tide seawater levels and sea depth at various locations within one km distance from the sea coast.
- (vii) Distance from roadways.
- (viii) Railway and port facilities.
- (ix) Ambient temperature (max./min.) and variations during different periods of the year.
- (x) Rainfall, if any, with seasonal details.
- (xi) Wind characteristics with seasonal details.
- (xii) Details of existing water resources, if any, and availability of service water during the construction period of the project.
- (xiii) Availability of land for setting up the desalination plant and for storing the product water.
- (xiv) Erosion characteristics of the soil near the sea coast.

4.2. Seawater Data Sheets

- (i) Complete chemical analysis of seawater during various parts of the year, including COD, BOD, suspended matter and dissolved gases (NH_3 and H_2S).
- (ii) Min. and max. temperature of seawater during different periods of the year.
- (iii) Details of any power plant, chemical plant and other industries in the vicinity of the proposed site and the details of effluents being discharged or likely to be discharged into sea from such industries.
- (iv) Details of marine life and biofouling characteristics of seawater.

4.3. Pollution Control Regulations in the Area

- (i) Maximum permissible limits on the discharge of concentrated brine (w.r.t. concentration, temperature and chemicals used for pretreatment of seawater).
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