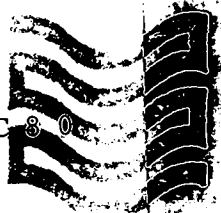


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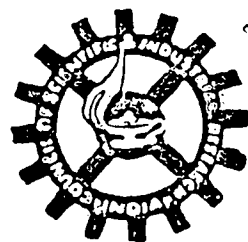
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# Slow Sand Filtration Project

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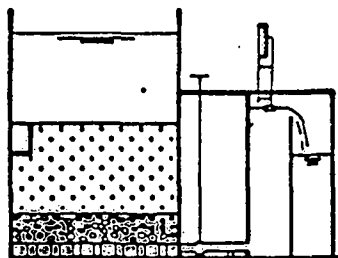
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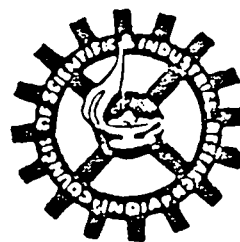
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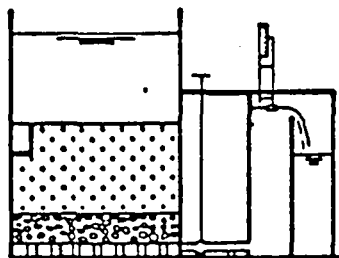
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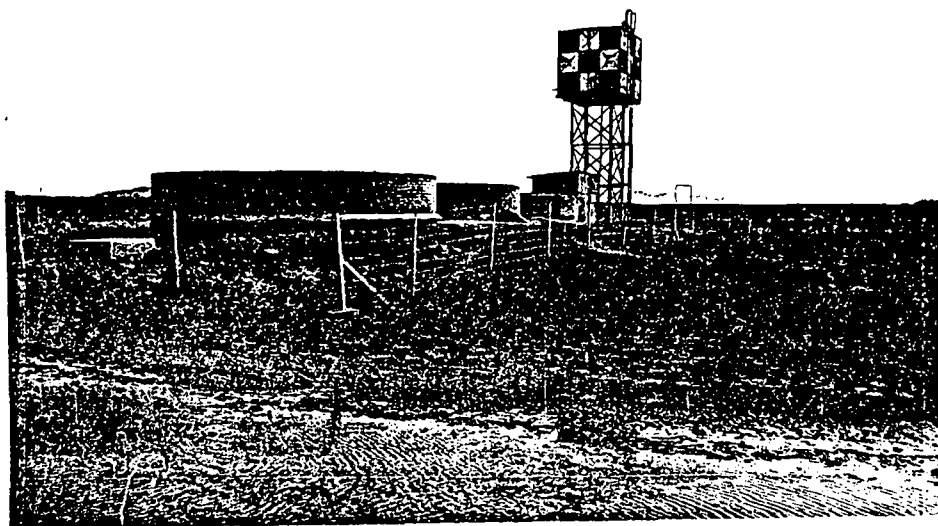
## SLOW SAND FILTRATION IN THE RAHAD IRRIGATION SCHEME

### 1. INTRODUCTION

Since 1962, Slow Sand Filters have been constructed in the Gezira Irrigation Scheme and about 200 units are now scattered throughout the area. All units are of standard design with minor modifications depending on the specific circumstances. Although built in large numbers, the filters do not perform satisfactorily. The two main reasons for this poor performance are:

- the filters are not regularly cleaned and maintained
- the sand specifications are doubtful.

During the course of the Research and Demonstration Project on Slow Sand Filtration, the Rahad Corporation became involved because, as the body responsible for the development of the Rahad Irrigation Scheme, they were already actively planning and implementing water supply schemes which included surface water treatment by Slow Sand Filtration.



Standard Treatment Plant in the Rahad.

Sedimentation tank, 2 Slow Sand Filters and an Elevated Tank.

## 2. RAHAD IRRIGATION SCHEME

The Rahad Irrigation Scheme is located on the east bank of the river Rahad in a strip 15-25 km wide and 140 km long. At Fao mountain, the strip is bisected by the new highway connecting Wad Medani and Gedaref. The main town, El Fao, is situated about 260 km from Khartoum. About 70% of the scheme is in Kassala Province while the remaining northern part is in Gezira province.

There is a good network of all-weather roads within the project area. The climate in Rahad area is dry with maximum temperature in May/June, 42C and minimum in January 12C. Rainfall ranges between 173 and 237 mms per annum in the north and 321 to 543 mms per annum in the south (1969 - 72 data). The rainy season starts around May and ends by October.

The project draws its water from the Blue Nile through a supply canal 50 km long which originates from Meina, near Singa, carrying water by gravity, crossing under river Dinder in a siphon and discharging into the river Rahad at a point, 7 km downstream of Mafaza (Map 1). The supply canal leads to Abu Rakhm Barrage on the river Rahad. From the barrage, a main canal of 90 km length with a design capacity of 100 m<sup>3</sup> feeds the project area by means of a system of canals of descending order of magnitude namely major, minor, Abu Ishreens (water course) down to Abu Sittas (farm channel in basin irrigation systems). A drainage system has also been established for taking surface run off through minor drains which pour into the main collector drains.

The project is designed to transform 126.000 ha of semi desert land, originally utilized for rain grown sorghum, into a fertile farming area in which 100.000 people will be resettled. At present, there are about 50.000 people including management staff living in 30 villages. In addition, about 50.000 seasonal labourers come to the area annually for cotton picking. The project area is divided into 3 groups, each of approximately 42.000 ha. Each group is sub-divided into 3 blocks. The main crops cultivated in the project area are cotton and ground nuts. The tenancies are of two kinds, either 7 ha on which the standard rotation is grown, or 1½ ha on which vegetables and fruits are grown. There are approximately 12.800 tenants of the former and 4.000 of the latter type. It has been permitted to grow fodder in the rotation system to enable tenants to integrate some of their livestock holdings into the scheme. Presently, Stage 1 of the envisaged irrigation scheme is nearly completed. It is planned to develop another 250.000 ha in the two next stages.

### 3. SLOW SAND FILTRATION PLANTS

#### 3.1 General

The Rahad area used to be a semi-desert area, sparsely populated by nomadic herdsmen, who, during the rainy season, utilized it to grow their annual crop of sorghum.

Since the beginning of the 1970's, the Rahad Corporation is trying to convert the land in a fertile area, suitable for the production of cotton and ground nuts. However, the original population is too small to work the land and therefore, a big seasonal influx of labourers from neighbouring areas can be noticed. In order to structure the settling of these labourers, a number of planned settlements is constructed, consisting of a government block (offices, school and civil servant housing) and a water treatment plant. During the cotton picking season, the population settles in clusters of straw huts around these planned service points. In the last few years, it could be noticed that quite a lot of people decided to settle permanently.

#### 3.2 Water-supply

According to the development plan, all the villages in the Rahad irrigated scheme, will be provided with piped water supply. Ground water will be used as a source of supply where suitably available within a narrow strip along the Rahad river, while surface water, after treatment by plain sedimentation and slow sand filtration, will be used for domestic supplies in the remaining villages of Rahad.

The surface water is taken from the irrigation canals. Although the water originates from the Blue Nile, it does not altogether have the same characteristics as the Blue Nile water. This is due to;

- low velocities existing in the irrigation canals, causing an increase in organic load and a decrease in silt content
- rainfall. In the rainy season, most of the water discharged into the canal is supplied by the river Rahad which, during that season, receives its water from rainfall.

The standard plants consist of the following elements:

### 3.2.1 Intake

Through a submerged intake, the water is supplied by gravity to the sedimentation tank and the Slow Sand Filter.

### 3.2.2 Sedimentation Tank

A circular sedimentation tank is used with radial flow and a detention time of approximately eight hours.

### 3.2.3 Slow Sand Filter

The filter is circular with a cross section of about 5 m. For each village 2 filters are provided.

#### Design criteria

population: 3000 - 3500 per village

water demand: 80 l/cd.

Note. Apart from human consumption, water will be used for irrigation of e.g. vegetables, shading trees, etc., inside and outside the plots, for watering of domestic animals and, during hot weather, also for sprinkling of water inside the living quarters in order to modify the temperature.

filtration velocity: 0.15 m/hr

sand specifications:

Effective size 0.30 - 0.35 mm

Uniformity Co-efficient 1.7 - 2.0.

### 3.2.4 Clear Water Well

The storage capacity in the clear water well should be sufficient to allow for discontinuous pumping of water to the elevated tank.

The water is usually lifted up to the elevated tank by one or two hours of pumping in the morning and in the evening.

### 3.2.5 Public Standposts and House connections

Currently, the water is supplied through one or two public standposts, located near the treatment plant and the market place. The buildings in the Government block have either a house connection or a standpost in the yard. In the near future, an extension of the distribution system is envisaged.

### 3.3 Operation and Maintenance

For each of the treatment plants, an operator is employed. After a brief training at the waterworks in the main town of the Irrigation scheme, he receives further training on the job.

The responsible engineer and his assistants pay frequent visits to the plants in order to advise, and supervise the operation of the water supply scheme. A mobile maintenance team visits the plants regularly in order to cater for the necessary maintenance of the more complicated parts of the plant. This team is also "on-call" for emergencies.

### 3.4 Evaluation of the performance of the filters

In the newly completed waterworks of El Fau, the main town of the scheme, a laboratory has been set up to monitor the parameters which are relevant to drinking water. Presently, testing for turbidity, Chlorine residual and E-coli content, is being performed for the filters in the Demonstration Villages. The results of this monitoring are expected to be available shortly.

#### 4. Health Education and Community Participation

The social service department is currently being set-up in this irrigation project. It is planned to follow the same methodology as was used in the Gezira area.

This comprises inter alia activities such as

- training of health workers for the various health education activities
- meetings with different groups: women's associations, youth organisations.
- Radio and Television broadcasts on important local health problems
- Stimulating participation in health centre activities, especially nutrition and child care.



Carrying of water by head-load and transport by donkey-drawn water carts.



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