

A CONSOLIDATED LIST OF MEKOROT'S NEEDS

A List of Mekorot's Acute Needs

- Water Quality and Security: The development of an integrative sensor that would include the analysis and processing of data regarding chemical, biological and radioactive pollutants.
- Desalination: The testing of membrane processes for sea water and streams especially treatment with M.B.R.
- Sewage Treatment: New methods and equipment are required, over and above the existing physical methods (e.g. PH, conductivity measurement) for constantly monitoring and identifying poisonous waste in the sewage treatment facilities.
- Engineering Services: Sensors for monitoring deep wells, the water levels in these drillings, photographic equipment, temperature and vibration measurements.

Requirements in the Field of Water treatment and Water Quality

- Develop technologies for eliminating accumulated oil from the water surface at the drilling shaft due to the pump's lubricants
- Develop technologies for reducing the deterioration of the chlorine concentration in the hypo chloride solution during the time the solution is stored
- Eliminating H₂S from water in various ways: (1) simple and economical ways for eliminating H₂S from salty ground water without expulsion (or with minimum expulsion) of H₂S into the air; (2) Technologies for reducing H₂S in well water to a very low concentration below the level where it can be smelled or tasted (0,05 ppm); (3) An economically viable and simple technology for the treatment in order to eliminate/reduce the unpleasant odor caused by the release of H₂S into the air in water treatment facilities.
- Eliminating iron from ground water: alternative technologies to those used today (oxidizing Ferrous dioxide that dissolves in water to Ferric trioxide which does not and then eliminating the residue suing a sand filter). The existing process clogs the water aperture during the filtering process and/or slows the filtering process.
- Environmentally friendly methods of water purification: creating materials that cleanse the site by themselves (for example producing chlorine form salts or chlorides)
- Eliminating sand and Manganese from water used for irrigation (salty water and pipes)

- Methods of purification that leave no residue
- Technologies for eliminating radioactivity from water
- Development of technologies for treating water used to rinse filters, meant to reduce the water loss in filtering systems

Sewage and Reclamation Requirements

A. Sewage and Sludge:

- New methods and apparatus above and beyond the existing physical ones (i.e. PH, conductivity measurement) for continuous detection in real time of the presence of poisonous waste in the sewage treatment plants.
- Methods of continuously identifying and monitoring changes in the composition of the sewage load at the input to the plant and its reactors in order to increase the efficiency of controlling the process and reducing the operating costs.
- Improving the hydraulic/physical/chemical process to make the separation of the solids in the treatment plant more efficient in treating the sewage:
Authorization:
above 4%, extraction above 18%
- Models for the optimization of breaking down organic material and removing nutrients (N,P) in the process of reconstituting sludge
- A technology for reducing the concentration of nutrients (nitrogen and phosphorous) as a byproduct of the return flow in the process of treating sludge using a membrane or other process for sewage treatment
- Membranes or other technology for sewage treatment
- Advanced technology for treating sludge that is economically viable to obtain type A sludge as well as technologies for reducing the quantity of sludge

B. Pipes:

- Advanced technologies for tertiary treatment in pipes having a high concentration of solids and extensive procedures for treating sewage including separation of algae.
- A technology for preventing the clogging of the input pipes to the Dan area sewage treatment plant (SAT), due to the concentration of flying material and/or hydraulic load and reduced temperatures in Winter.
- Understanding the mechanisms affecting the dissolving of manganese in the aquifer located in the fields where the pipes penetrate and that cause a

reduction of clogging in agricultural irrigation systems. Also needed are technological or other solutions for preventing this phenomenon.

- A combination of technologies (physical and chemical) to prevent the creation of biofilms.
- Advanced technologies for eliminating dissolved organic material from the pipes.

Requirements in the Field of Biology

- Technologies/devices that are environmentally friendly for the prevention/reduction of the blooming of plankton in the bodies of water-algae and other tiny water creatures.
- Technologies/devices for the continuous measuring, in the field, the quality and quantity of algae of different types
- Computerized systems for measuring the quantity of microscopic creatures in water (plankton)
- Intelligent systems for monitoring and classifying the different types of fish in reservoirs-size, number and type
- A technology for eliminating fish from the pumping points of water supply reservoirs
- Advanced warning systems for identifying the intrusion of pollutants/poisonous material into the water supply system

Requirements in the Field of Environmental Quality

- A proven model for evaluating the danger level to the environment that could be caused by drilling for drinking water. This model should be based on the data regarding the area of the drilling, physical data regarding the drilling, the capacity of the pumping and hydraulic data.
- An up to date, computerized data base regarding environmental damage fed by data from governmental institutions that represents the current picture of the situation.

Mode Requirements (Water Resources)

- Reduction of water depreciation- identify leaks in real time (including the exact location of the leak), water theft.
- A technology for reducing the cost of energy-energy costs are the major component in the operation of the water supply system by Mekorot
- Models for simulating the water treatment processes (coagulation, flocculation)



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Subjects for Development in Desalination

Pretreatment:

- Preliminary methods for purifying the system (preliminary treatment and R.O.)- UV of various types or purifying the membranes using advanced disinfectants
- Advanced Operations for Purification (AOP)

Desalination Process

- Methods of testing the development of biofouling in the membranes used in the process of the desalination of salt/sea water using the reverse osmosis method
- Purifying membranes with advanced disinfectants
- Eliminating Boron from the final product of the desalination process: Develop cheap and efficient active filters

Treating Concentration

- Methods of removing radioactivity in the concentration of the desalinated well water
- Silt Density Index (SDI)
- Technologies for reducing the volume of the concentrate and increasing the recovery ratio

Requirements in the Field of Maintenance-Engineering Services

- Composite Materials: For building pumping equipment (pumps, pipes, hydraulic accessories), of appropriate strength and the ability to withstand the corrosive nature of water
- Sensors: For monitoring deep drilling sites from the standpoint of: the water level in the drilling, photographs, temperature and vibrations.
- Sensors: For monitoring the condition of the guiding cable in the reinforced concrete pipe with a diameter of 108", 68" in the National Water Carrier and the Yarkon lines.
- Photography: Thermal and other type cameras for identifying wet spots in the ground that indicate leakage of water via earthen dams, reservoirs and bust pipes
- Photography: Miniature cameras, placed remotely to photograph the carrying lines when dry (operational test), when the line is in constant operation (to detect leaks, blockages, sediments, etc.)

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- Cameras using fiber optic technology that can descend hundreds of meters to the bottom of a drilling.
- A robotic locating system: A sonar installation or another monitoring method controlled by a robot during cleaning/sampling of the water reservoir covered by floating sheets.
- Ultrasound systems: For cleaning filters at the base of the drilling, for cleaning irrigation systems and accumulated waste material in pipes
- Laboratory Services in non-destructive testing (NDT): Testing the chemical composition of steel, testing the rate of corrosion (thickness of the wall) in steel pipes.
- Methods of measuring the depth of the drilling: Precise mapping of the geometry of the drilling done deep into the ground, diameter of 12" to 18", to a depth of 1000 m (by means of a gyro, laser technology, etc.)
- Anti Corrosion Coating: To externally protect the steel pipe, completing the polyethylene coating of the pipe performed at the factory which must be completed in the field after welding the pipes together

Security Requirements

- Hidden and exposed alarm systems at Mekorot's installations at various levels (ground, air...)
- A control and command system integrated with a water supply monitoring system
- A photographic analysis system (Outdoor V.M.D analysis), decreasing "volume" of the picture, etc.)
- Communication between terminal units and the area/secondary center (terminal unit can be a fixed installation or on a vehicle)

Requirements in the Field of Management and Control

- Transfer of pictures/agreements from Mekorot to the Security Hubs and Control Centers using standard communications methods (cellular phones, Bezeq)
- Advanced terminal installations based on intelligent, standard communications and standard PLC control equipment
- Off-the-shelf software for integrating models that will streamline the operation, conserve energy in the control centers by combining them with the existing SCADA systems.
- Energy sources when connecting the terminus/client from afar

Development of a data base in a transmit/receive system for the collection basin



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Requirements in the Field of Project implementation- Implementation Branch

- Advanced technology regarding the labor of the laying of pipes that conserves resources (automatic welders, etc.)
- Continued research and identifying of advanced materials that are environmental friendly for cloud seeding
- Combining of advanced cellular and satellite communications systems in the cloud seeding process
- Identifying advanced raw materials and coatings that enable continuous work for many years in water pumping equipment that are corrosive, salty, etc.
- Advanced communications and equipment in the field of control and management combined with hardware
- Identifying and integrating environmentally friendly technologies for eliminating micro pollutants from drinking water
- Integrating advanced technology for water treatment, desalinization and sewage.