

esses do not approach theoretical efficiency. Whereas one could only hope to increase the efficiency of an electric motor by a few percent through additional research, there is a very real opportunity to increase the efficiency of water desalting processes by a factor of five or more. The best method of attaining major improvements in product water costs is through research on the principal sources of irreversibilities (inefficiencies). For most desalting processes, these irreversibilities arise largely from transport of energy or matter at phase boundaries. Nearly all of the present processes require more than 30 times the work energy needed for reversible separation. Several processes can use the work available from low-temperature energy, which is seldom useful for other purposes. Existing methods employ semipermeable membranes or interfaces between phases (liquid-vapor, liquid-solid, or liquid-liquid). Most of these are rapid but thermodynamically quite inefficient; others are more efficient but slow. Basic research will provide a better understanding of both the transport processes and the thermodynamic losses. Thus, research has an opportunity and potential of truly unusual dimensions for achieving dramatic reductions in the cost of desalting water. Additionally, this information will find application in separation processes used in areas other than desalination.

Commercial saline water conversion is already a fact, and industry has assessed it as a basis for profitable expansion and diversification. As new technology drives down the cost of product water, desalination will find increasing application as the cheapest or only alternative means of obtaining a supplemental source of supply in an ever greater number of areas.

The work sponsored by the Office of Saline Water has stimulated research and development activities throughout the world, and this, in turn, has led to the accelerated development of new or improved desalting processes. The Office of Saline Water is recognized as the world center of desalting technology, and this information is made available to all who wish it. By utilizing the scientific capabilities of OSW in a continuing program of basic and applied research, the Department of the Interior will maintain its position of leadership in this new area of water supply.

ESTUARINE ECOLOGICAL SYSTEMS AND POLLUTION CONTROL

The great coastal zone of the United States in which the land and river systems join to become the oceans is one of our great natural resources. This unique geological region is the entrance to the river systems for immensely valuable anadromous fish, such as the salmon and the shad, the nursery ground for one stage in the life cycle of the shrimp, and the permanent home for crabs, oysters, and clams and the temporary home for millions of migratory waterfowl. Approximately half of the Nation's population lives within easy driving range of the estuaries and the coast—a favored location which is exploited to the fullest degree during the summer months when the seemingly endless coastal resources are subjected to great multiple-use pressures. Twenty-four States, the District of Columbia, Virgin Islands, Puerto Rico, and Guam enjoy the ownership and control of this unique area. Congress has also recognized the great national interest in these resources and, in the Clean Water Restoration Act of 1966, directed that a national study be made to provide a technical and administrative base for development of future management policy.

Science and technology necessarily have an important role in understanding the complex relationships among estuarine biological populations and the responses of these populations to changed environmental conditions induced by man's actions. Cataloged in broad terms, these relationships include the problems of eutrophication, in which undesirable aquatic growths are overstimulated by nutrients from industrial, agricultural or municipal wastes; sediments from agriculture, construction, industry and channel maintenance which change bottom characteristics and smother desirable plants and animals; biologically active chemicals, such as pesticides, sulfite waste liquors, and detergents which interfere with the most fundamental of the life processes of reproduction and normal growth; the availability of oxygen—necessary for the life of most desirable organisms—which is directly related to the oxygen depletion characteristics of industrial and municipal wastes; heated water from industry and power stations and its perhaps subtle effects on biological populations accustomed over centuries to a narrow range of temperatures; and oil along with its devastating effects on both beaches and biological populations as so dramatically brought to our attention in recent weeks. Each of these problems must be understood and resolved both as an entity, and in relationship to each other, within the broad