

ABSTRACT

A Methodology for Generating Distribution System Pumping
Schedules in the Presence of Maximum Demand Charges and Multiple
Pressure Zones. (May 1995)

Richard Andrew Jamieson, B.S., Texas A&M University;

M.S., Texas A&M University

Chair of Advisory Committee: Dr. Joseph W. Foster, III

A methodology is presented for generating pump schedules for water distribution systems. The minimum energy consumption pump scheduling problem has been characterized in the literature as a discrete, non-linear, and generally non-convex problem. For this reason dynamic programming has been the traditional approach to pump station scheduling. The consideration of a cost function with components for maximum kW demand as well as energy consumption introduces another characteristic: non-separability. For distribution systems comprised of multiple pressure zones, the optimization problem has a decision space of rapidly increasing dimension due to the possibilities for interaction between pressure zones. This work is concerned with the development of a scheduling methodology that will perform under a ratchet maximum kW demand rate structure in a multiple pressure zone environment. A dynamic programming algorithm is modified to provide status information about each station. This status information then drives an assignment algorithm designed to allocate inter-zone transfers. Thus, rather than deal with the fully dimensional

optimization problem the methodology works with the smaller, easily managed pump station problems, and subsequently focuses on inter-zone transfers with the connectivity between zones, excess capacities, and shortage conditions defined.