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NASA TECH BRIEF



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Pump Simulator Provides Variable Pressure-Flow Characteristics

A pump simulator with variable pressure flow characteristics has been designed for use in experimental testing. The simulator uses a "work horse" pump along with high response valving and controls to create a head-flow characteristic that may be varied from the control room during test operations. This pumping system permits convenient adjustment of the pump load combined operating point and makes possible the investigation of optimum pump load matching. It has been successfully used to investigate the effect of feed pump characteristics on the stability of a Rankine system boiler.

The pump simulator consists of an electrohydraulic control mated with a work horse pump (or other source of pressurized flow). The control consists of: (1) Pressure and mass flow sensors mounted in the fluid flow line ahead of the system load, (2) these sensors feed into a control unit programmed for any desired dynamic curve of pressure-mass flow. The sensors' data and desired curve are compared and result in the output of a position signal feeding to: (3) a high response servo valve. The valve is continuously repositioned by these command signals. The combination permits examination of pump-load combined operating point(s) in terms of system dynamic stability under variable pump characteristics.

The significance of this development is that the pump simulator permits ready experimental determination of optimum pump-load matching. This then permits drawing pump specifications for a pump which will result in a dynamically stable pump fed system.

It also appears that the pump simulator could be used as a "special pump." That is, in certain applications, the simulator could be used *in place of* a special design pump. In effect, the pump simulator, by simple program change in the controller, could comprise a large family of special design pumps. Alternately, the pump simulator can provide a much more versatile dynamic characteristics range than can be achieved by any single pump.

Notes:

1. Possible applications for this pump simulator are in: (a) variable pressure-flow dynamics hydraulic systems; and (b) experimental determination of necessary pump characteristics to yield a dynamically stable pump-load system.
2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135
Reference: B67-10453

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D. C. 20546.

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Category 05