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PARTIAL MODIFICATION OF 190-KW PUMP NO. 1,
PROJECT CGI-883:
INCREASED PROCESS WATER FLOW - 100-K

INTRODUCTION

The 190-KW process water pumping Unit No. 1 is scheduled to be modified for increased pumping capacity under Project CGI-883. Component parts for this modification are expected to be received during June 1960. Installation of these components would require approximately ten days; due mainly to grinding of the high lift pump case to make room for the new larger diameter impeller. In order to minimize lost production, it has been proposed by K Reactor Operation that the high lift pump be modified early this spring during the scheduled maintenance overhaul period on pumping unit No. 1⁽¹⁾. The test impeller recently removed from the No. 1 high lift pump in KE would be repaired and installed in the KW pump at this time. Later, in June or July when the components for the complete modification are available, the low-lift pump and drive motor would be modified and associated electrical and instrument alterations would be completed during a normal reactor outage. Adoption of the proposed plan would make it necessary to operate the modified high lift pump for a period of approximately three months with an unmodified low-lift pump. A study was made to determine the feasibility of operating the pumping unit in this manner and to determine the probable operating conditions. This document reports the results of that study.

CONCLUSIONS:

It is technically feasible to operate the modified No. 1 high lift pump in series with the unmodified low lift pump provided the flow rate of the No. 1 unit is maintained approximately equal to that of the other existing four or five pumping units operating in parallel with it. Under these conditions the flow rate of the No. 1 unit would be approximately 31,000 gpm and 29,700 gpm for five and six pump operation respectively and the corresponding operating speed of the No. 1 high lift pump would be about 1585 and 1590 rpm respectively. The above conclusions are based on the use of the 31 7/8 inch diameter test impeller which was recently removed from the 190-KE No. 1 pump.

DISCUSSION

In order to operate the modified high lift in series with the unmodified low lift, two limitations must be considered. The capacity capability of the low lift pump must not be exceeded and the required net positive suction head for the high lift pump must be available. The present "Cavitation limit" of approximately 31,000 gpm on the flow for the existing pumping units is also a reasonable flow limit for the unmodified low lift pumps.

The required NPSH for the modified high lift pump at 31,000 gpm as determined from previous testing is about 110 feet⁽²⁾. At 31,000 gpm and with the unmodified low lift pump the available NPSH to the high lift pump is 120 feet. The available NPSH exceeds the required and the high lift pump should operate without loss of performance or excessive cavitation at flow rates up to and including 31,000 gpm.

- (1) Letter dated March 24, 1960 - P. E. Lindstrom to H. A. Zweifel
- (2) HW-60659 "Report of Preliminary Testing Production Test IP-234-AE, Project CG-775 - Prototype Testing of the 190-K Process Pumpint Units" - M. H. Schack et. al. - June 15, 1959

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-3-

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Figure 1 shows a plot of the cavitation characteristics of the modified high lift pump. The proposed operating condition at 31,000 gpm and 1585 rpm is shown on the curve and plots in the region of no audible cavitation or loss of performance.

The use of the test impeller which was removed from the 190-KE high lift pump No. 1 is a temporary measure and will be replaced at a later date with a final design impeller of larger diameter.

M. H. Schack
Reactor Modification Design
FACILITIES ENGINEERING SECTION

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CAVITATION PARAMETER, $\sigma = \frac{NPSH}{TDH}$

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