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DPST-87-235

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MEMORANDUM

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# Melter Feed System
# 3-way Feed Valve
# Auma Motorized Operator


Summary

The Scale Melter at TNX is currently testing a feed system representative of the DWPF. One component of that system is a valve operator, which directs the feed slurry or flush water through the 3-way ball valve to the melter. This valve operator, made by AUMA™, is the same type which will be used in the DWPF, but may be causing problems on the TNX Scale Melter by failing to accurately align the feed valve ports.

Accurate alignment of the 3-way feed valve is essential to the smooth operation of the Scale Melter feed system. During an inspection of the Scale Melter feed system, it was found that the Auma operator was not aligning the ports of the 3-way valve properly, leading to possible plugging and feed rate control problems.

The Auma operator used to position the melter 3-way valve is a sensitive piece of equipment which cannot be adjusted remotely. Experience on the Scale melter with Fujikin 3-way ball valves (DWPF will use Everlasting sliding disk valves - to be tested on the Scale Melter) has shown that the valve operator may need to be re-adjusted periodically to compensate for valve wear.

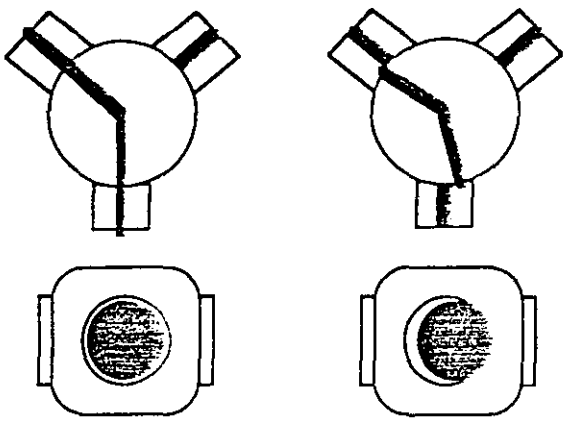
These observations are being documented to record and communicate our observations with the Fujikin 3-way ball valve, in preparation for testing the Everlasting 3-way sliding disk valve on the Scale Melter. When some knowledge of the Everlasting valves is obtained, a DPST will be issued summarizing the experiences of the 3-way valves in the Scale Melter feed system.

## Discussion

An Auma™ valve operator uses four limit switches and a clockwork gear mechanism to position the Scale Melter's 3-way feed valve in each of three required positions: Feed to melter, Flush water to melter, or Flush water to strainer (Figure 1). The valve position is determined either automatically by the melter feed system sequencer or manually by the control room personnel with a 3-position switch.

The feed valve and Auma operator were recently removed from the Scale Melter to inspect the valve and to try to isolate the cause of erratic feed flow control to the Scale Melter. During the inspection, it was found that the Auma operator was not adjusted properly, thereby misaligning the ports of the 3-way feed valve.

The alignment of the 3-way valve, especially in the "Feed to melter" position, is critical. Any misalignment provides a plugging point for the very slow (~0.4 gpm) melter slurry feed, and results in erratic melter feed rates. Even though the pump speed is controlled based upon flow rate to the melter, the pump speed increases to compensate for the partial pluggage and cannot adjust rapidly enough to avoid excessive flow when the pluggage breaks loose. With the Fujikin 3-way ball valves, a very small degree of rotational error results in a misaligned valve position. The Everlasting sliding disk valves proposed for use in the DWPF may be more tolerant to this amount of rotational misalignment. Further testing at TNX on the Scale Melter will determine if this is true.



Properly Aligned Valve | Misaligned Valve

Figure 2

The Auma operator uses 4 limit switches to align the valve at its three positions. Two switches are needed to align the valve in its center position, one when rotating clockwise, the other switch when rotating counterclockwise. Setting the Auma limit switches to accurately align the valve ports in the center position is very difficult. One reason for choosing the Auma actuator was for its short time between valve positions ( ~4-5 sec). However, once the limit switch is activated, the operator's motor coasts to a stop. When the valve is new and clean, the Auma's limit switches are set so that the valve coasts to a stop precisely at the right place for

each of the four limit switches. Any increase in the valve's friction causes the valve to coast less than when the valve was clean. Therefore, as the valve wears or the feed slurry interferes with valve operation, the proper valve positions are no longer guaranteed. The Fujikin ball valve was quite easy to rotate. The Everlasting sliding disk valve may require more torque to rotate the valve, thus the Auma operator may not "coast" very far.

The problem of alignment is compounded when the "Feed to Melter" position is chosen as the center position, the Auma operator must stop the valve at precisely the right point whether turning clockwise or counterclockwise. That is, both center position limit switches must be set exactly. This was such a difficult task on the Scale Melter that eventually the "Flush to Strainer" position (determined to be the least critical of the three) was chosen as the center position.

The Auma operator is capable of positioning the valve at any three points on a circle that one could choose, even turning the valve several rotations before stopping. This flexibility becomes a liability, however, when accurate limit switch settings are required. Precisely setting the limit switches is difficult due to the fact that the operator has been designed so that it could rotate the valve 150 times before stopping. We utilize less than one turn (~ 240 degrees) of the Auma operator to position the Scale Melter 3-way ball valve. The DWPF melter feed valve operator should be carefully examined and designed for simplicity and accuracy.

Future Work

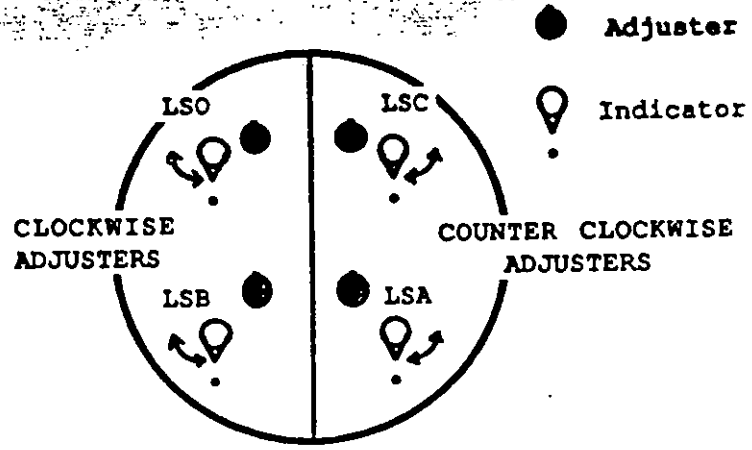
The operator should be manufactured specifically for this application, so that the limit switch adjustment (if necessary) would be simple and accurate.

The "Feed to Melter" position could be chosen as one of the end positions, not the center position. This most critical position would depend only upon the actuation of *one* limit switch, not two. This, however, means that the rotation from the "Feed" position to the "Flush to Melter" position (the most critical for flushing the feed tube) could take twice as long. An additional consideration is the possibility of pumping radioactive feed into the water flush line depending upon the valve rotation sequence and melter feed system sequence.

If the valve and/or operator used a mechanical stop to positively locate proper valve position, we would not have to depend on the limit switches for accurate valve positioning.

Everlasting sliding disk valves will be installed and tested in the Scale Melter feed system for run #7, presently scheduled to begin early May 1987. After the Everlasting valves are inspected, a DPST will be issued which will summarize the TNX experiences with 3-way valves in the melter feed system.

## AUMA OPERATOR LIMIT SWITCH ADJUSTMENT




## TOP VIEW OF FUJIKIN 3-WAY BALL VALVE
showing limit switch functions

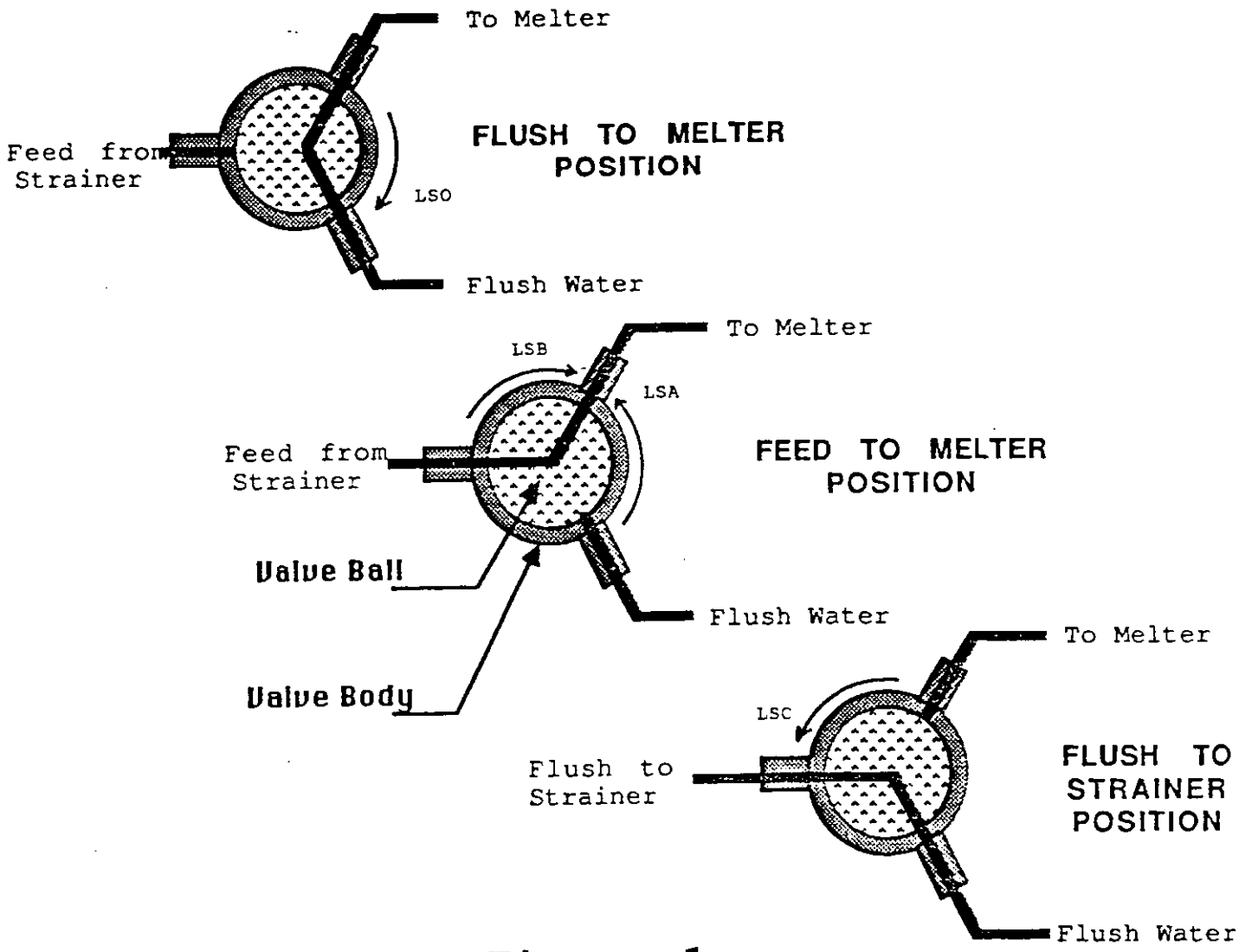



**Figure 1**