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**ORGANICS IN THE CHEMICAL PROCESSING CELL AND
THEIR POTENTIAL EFFECTS ON THE DWPF OPERATIONS
(U)**

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**Organics in the Chemical Processing Cell and
Their Potential Effects on the DWPF Operation (U)**

Based on observations made during the operation of the Integrated DWPF Melter System (IDMS), aromatic organics entering the DWPF Chemical Processing Cell (CPC) can be expected to distribute throughout the CPC Process Vessel Vent System (PVVS) and Mercury Purification Cell (MPC). The potential impacts to the operation of the DWPF are discussed.

INTRODUCTION

If the DWPF maintains its current flowsheet, aromatic organics will enter the DWPF CPC from the Salt Processing Cell (SPC) with the Precipitate Hydrolysis Aqueous (PHA) product. These organics will be present as dissolved phenol,

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benzene, and phenylboric acid (PBA) and as heavy "high boiling" aromatics which have been adsorbed onto the insoluble sludge and titanate solids in the PHA. The benzene and PBA contents of the PHA are of interest because of their flammability potential in the CPC. These concerns, however, have been addressed and the appropriate controls are in place. Therefore, this report will discuss the potential impact of the heavier, non-polar aromatics (~90% diphenylamine and biphenyl).

DISTRIBUTION AND IMPACT

During the operation of the IDMS, the heavy aromatic organics entering the SRAT with the PHA have tended to be steam stripped during the evaporation operation. These organics have tended to distribute at various points in the IDMS feed preparation system. Specific details of the organic accumulation and the potential impacts to the operation of the DWPF are summarized below:

1.0 ACCUMULATION IN THE MWWT

Type/Amount:

Heavy organics (specific gravity > 1) have tended to settle to the floor of the IDMS MWWT^[1]. Samples taken from the IDMS MWWT mercury sump after several feed preparation cycles suggest that up to 5 liters of organic material will accumulate in the MWWT with every SRAT batch.

Potential Impact:

In the DWPF operation, accumulation of heavy organics in the MWWT would result in potentially "dirty" mercury^[2] with organics being transferred to the nitric acid wash in the Mercury Purification Cell. A prototypic mercury pump is being fabricated to be installed in the IDMS MWWT and will be used to evaluate the amount of organics transferred to the MPC.

Further, any organic which is not sent to the MPC will simply be retained in the MWWT which will eventually completely fill with this organic material and overflow back to the SRAT.

2.0 ACCUMULATION IN THE PVVS PIPING

Type/Amount:

The organics have also tended to form a coating on the piping in the IDMS PVVS. This coating is similar in composition to that which is found in the MWWT. The organic fouling is most severe inside the SRAT Condenser (in the tubes) and at the vapor exit of the SRAT Condenser. The fouling becomes less severe in the piping downstream of the SRAT Condenser.

Potential Impact:

The DWPF can expect to suffer a loss in the heat transfer efficiency of the SRAT Condenser. The IDMS SRAT/SME Condenser Heat Transfer Coefficient (HTC) has consistently declined since the introduction of the PHA[2,3]. With a much more aggressive production schedule than the IDMS, the DWPF can expect a more accelerated fouling of the SRAT Condenser.

If ammonium nitrate also accumulates in the PVVS header, then the particular organics which are expected to deposit will act as a "sensitizer" for a potential ammonium nitrate (NH_4NO_3) explosion[4].

Additionally, organics in the PVVS header can deposit in the vapor sample lines which will be used to monitor for hydrogen. This may result in inaccurate hydrogen values which would, in turn, result in unnecessary process interlocks.

3.0 FAVC HEME

Type/Amount:

Organics can be expected to accumulate on the High Efficiency Mist Eliminator (HEME), a fiberglass filter internal to the Formic Acid Vent Condenser (FAVC). The HEME in the IDMS FAVC is fouled to the point that it must be bypassed because of excessive pressure drops across it. A new FAVC HEME is on order. Once the new filter is obtained, the present HEME will be removed to evaluate the extent and type of fouling.

Potential Impact:

If the DWPF FAVC HEME is fouled at an accelerated rate, there would be a loss of attainment due to frequent HEME changeouts.

If the DWPF FAVC HEME is fouled to the point that it must be bypassed in order to operate (as is the case in the IDMS), there would be a potential increase in mercury emissions.

REFERENCES

- [1] J. A. RITTER, et. al., "Integrated DWPF Melter System Campaign Report: Coupled Feed Operation", WSRC-TR-90-0131, (1990).
- [2] N. D. HUTSON, et. al., "Integrated DWPF Melter System Campaign Report: Mercury Operation", WSRC-TR-91-0363, (1991).
- [3] N. D. HUTSON, et. al., "Integrated DWPF Melter System Campaign Report: The First Two Noble Metals Operations", WSRC-TR-91-0400, (1991).
- [4] J. T. CARTER, et. al., "Recommendation for Control of Ammonium Nitrate Deposits in the DWPF Process Vessel Vent System", WSRC-RP-91-1174, (1991).

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