# RADIATION SAFETY MANUAL

FANSTEEL INC.
METALS DIVISION
Muskogee Plant

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The dissolution process consists of immersing the raw material in aqueous hydrofluoric acid. This is carried out on a batch basis with a number of batches in process at one time. The aggregate batch amounts in process at any one time do not exceed 25,000 kilograms of raw or feed material which contains not in excess of 100 kilograms of source material.

The feed material is first dumped from the containers into a hopper below the ramp level which feeds a belt conveyor. This conveyor is shielded and transfers the material inside the building over a sizing screen and onto a second conveyor which loads the feed hoppers. The hoppers are then raised to the third floor level by use of a mechanical hoist. They are then placed in position on a support stand and secured to a screw feeder which is attached to a covered digestion tank. A valve between the hopper and feeder is opened and the material is fed from the hopper through the screw feeder into the acid contained in the tank. Procedures have been put into effect whereby spilling and dusting are minimized.

After dissolution, the slurry is discharged into an extraction tank where the soluble fluorides of tantalum and columbium are preferentially extracted by contacting with methyl isobutyl ketone. During the batch extraction, the tantalum and columbium are separated from other constituents of the raw materials. Thus separated, the tantalum and columbium values in solution contain no radioactive materials and are further processed (refined) into semifinished and finished tantalum and columbium products. As noted above, these semi=finished and finished tantalum and columbium products contain no source material.

Upon completion of the above extraction, the residues, which consist primarily of insoluble fluorides and in which the source material is included, are discharged from the tank and transferred by pipeline to Pond 3. Water is added to the residues prior to piping in order to facilitate their flow.

Upon reaching Pond 3, the solids settle out and are retained while the supernatant (i.e. the liquid portion on top of the solids) is removed by surface decantation and pumped to the neutralization station where the supernatant is added to plant effluents and treated with lime.

Alternately, after dissolution, the slurry may be filtered through a filter press or some other mechanical separation device. The liquid is to be the feed stock for the liquid extraction process. The solids from the separation are to be stored in poly-lined drums. The drum containing the residue will be stored on site until authorization is obtained for disposal. The drums will be stored in such a manner as to preclude any unauthorized release of material. Any spillage will be washed into the neutralization system.

After grinding, the pulverized material is placed in a storage area for chemical processing. The grinding process does result in an increased surface area from which source materials could escape to plate out on nearby surfaces. However, these areas are washed after the grinding process and protective lids are placed on the ground material.

The raw material is transferred from the storage area to Chemical "A" or from the concrete storage pad to the Chemical "C" Building for dissolution and extraction of the tantalum and columbium. A concrete drive ramp was installed at these three sites in order to control spillage.

The batchwise dissolution process consists of contacting the material with aqueous hydrofluoric acid. It is initiated by dumping ore from the containers into a hopper below the remap level which feeds a belt conveyor. The conveyor is covered and it transfers the material over a sizing screen and onto a second conveyor which loads the feed hoppers. The hoppers are then raised to the third floor by use of a mechanical hoist. They are then placed in position on a support stand and secured to a screw feeder which is attached to a covered digestion tank. A valve between the hopper and feeder is opened and the material is fed from the hopper through the screw feeder into the acid contained in the tank.

After dissolution, the slurry is discharged into an extraction tank where the soluble fluorides of tantalum and columbium are more preferentially extracted by Methyl Isobutyl Ketone. During the batch extraction, the tantalum and columbium are separated from other constituents of the raw materials. The source material remains with the extracted residue. This residue is transferred to storage pond III through pipe. Water must be added to improve pumping efficiency. In the ponds, the residue solids settle and the supernate is decanted and treated with lime.

Alternately, after dissolution, the slurry may be filtered through a filter press or some other mechanical separation device. The liquid is to be the feed stock for the liquid extraction process. The solids from the separation are to be stored in poly-lined drums. The drum containing the residue will be stored on site until authorization is obtained for disposal. The drums will be stored in such a manner as to preclude any unauthorized release of material. Any spillage will be washed into the neutralization system.

In summary, the potential radiation hazards existing at the Fansteel Plant are limited to the following specific operations:

1. Potential radiation hazards associated with storage of raw materials.

2. Potential radiation hazards associated with pulverizing and handling certain raw materials.

3. Potential radiation hazards associated with chemical extraction of tantalum and columbium minerals from raw materials.

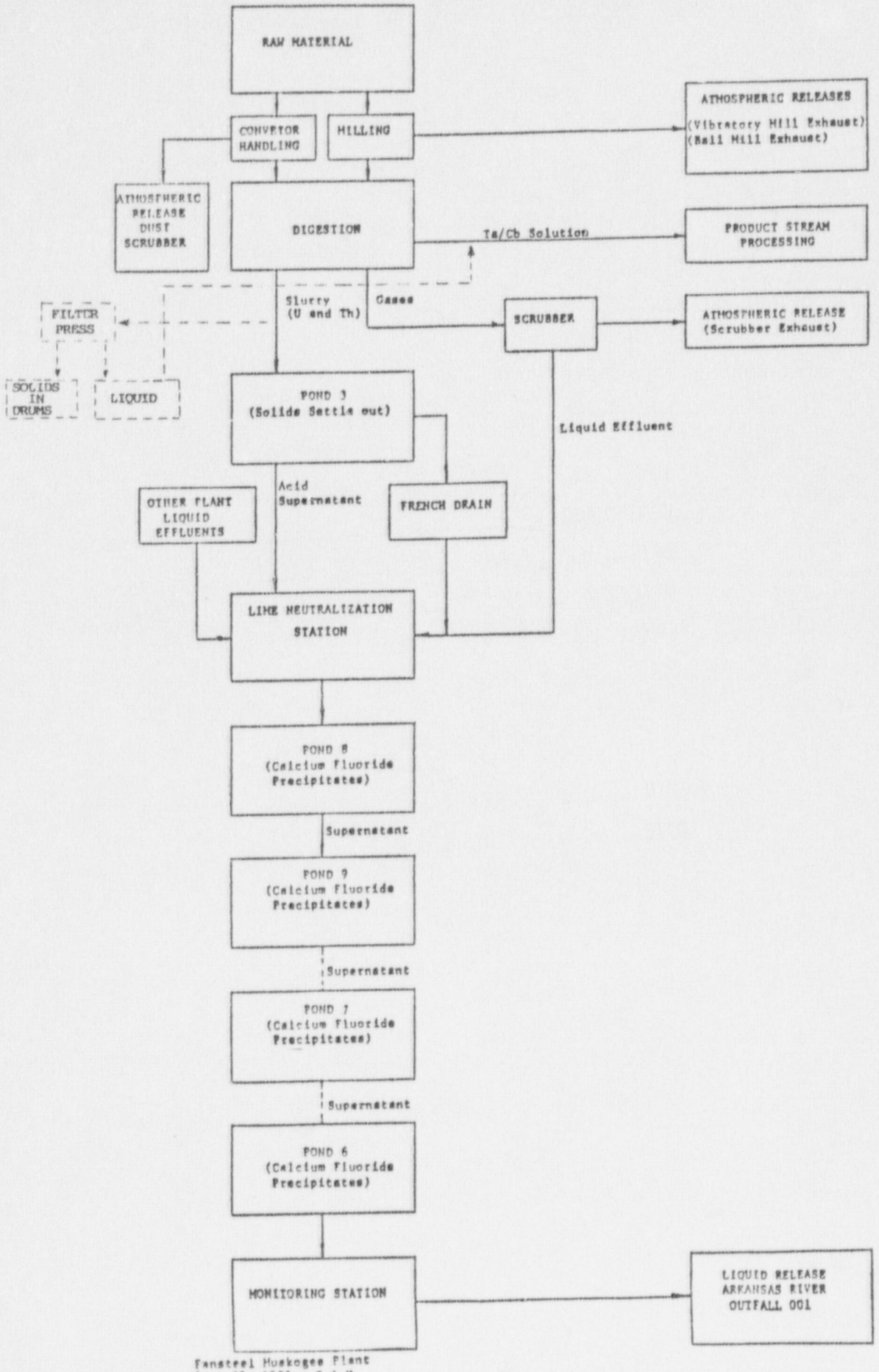
4. Potential radiation hazards associated with handling of residues undergoing settlement.

5. Potential radiation hazards associated with storage of residues in settling ponds.

Raw material and subsequent waste materials are processed to minimize personnel exposure to radioactive materials.

WASTE PROCESS FLOW CHART

FANSTEEL MUSKOGEE PLANT




Fansteel Muskogee Plant
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