

Department Of Energy (DOE) Pipeline Unplugging Requirements

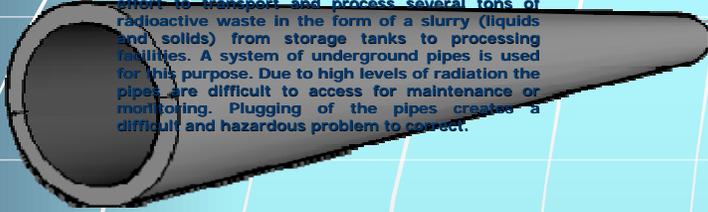
Pipelines used to transport radioactive waste



Jose Rivera, Florida International University, Intern at Idaho National Lab (INL)

BACKGROUND ON PIPELINE PLUGGING

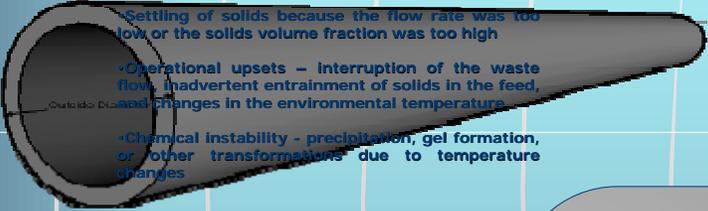
DOE sites around the country have an ongoing effort to transport and process several tons of radioactive waste in the form of a slurry (liquids and solids) from storage tanks to processing facilities. A system of underground pipes is used for this purpose. Due to high levels of radiation the pipes are difficult to access for maintenance or monitoring. Plugging of the pipes creates a difficult and hazardous problem to correct.



WHY DO THESE PIPELINES PLUG

Numerous causes include:

- Settling of solids because the flow rate was too low or the solids volume fraction was too high
- Operational upsets – interruption of the waste flow, inadvertent entrainment of solids in the feed, and changes in the environmental temperature
- Chemical instability - precipitation, gel formation, or other transformations due to temperature changes



A Tank Farm plug occurred at the Idaho National Lab because valve on 3" pipe did not open fully (globe valve not ball valve). Solids clogged the restricted passage. The globe valve was removed and no plugging has occurred since that event.



NuVision Engineering pipeline-unplugging skid tested at FIU.

Evaluation criteria/requirements for tank farm pipeline unplugging:	Rank	Weight (out of 5)	Total (Rank*Weight)
Safety	11	5	55
Operability	8	5	40
Compatibility With Current Systems	10	4	40
Pressure requirements	9	4	36
Tested Effectiveness	7	4	28
Environmental	6	3	18
Reliability	5	3	15
Cost	2	5	10
Maintainability	3	3	9
Retrievability	4	1	4
Training of personnel	1	2	2

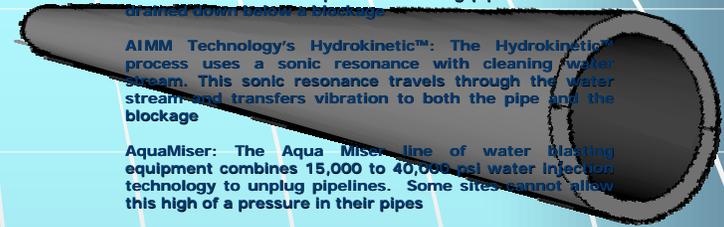
The criteria on the table above were ranked and weighted as high-to-low in importance to the Savannah River Site Liquid Waste Operations with input from the LW Structural Integrity engineering group.

AVAILABLE PIPELINE UNPLUGGING METHODS

NuVision: NuVision's technology acts as an ocean wave on beach erosion. It can operate on a long pipeline that has branched down, under a building.

AIMM Technology's Hydrokinetic™: The Hydrokinetic™ process uses a sonic resonance with cleaning water stream. This sonic resonance travels through the water stream and transfers vibration to both the pipe and the blockage.

AquaMiser: The Aqua Miser line of water blasting equipment combines 15,000 to 40,000 psi water injection technology to unplug pipelines. Some sites cannot allow this high of a pressure in their pipes.

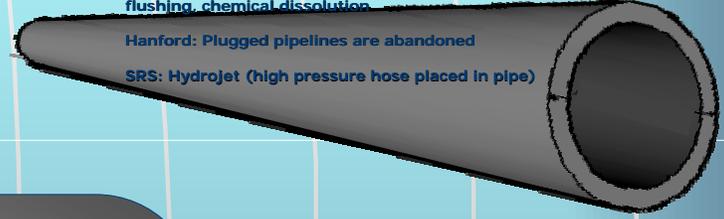


METHODS USED AT DOE SITES

INL: Hydro pneumatic roter (hydrojet) high pressure flushing, chemical dissolution

Hanford: Plugged pipelines are abandoned

SRS: Hydrojet (high pressure hose placed in pipe)



CRITERIA OR REQUIREMENTS THAT NEW METHODS MUST MEET TO BE USED AT DOE SITES

Pressure requirements: The maximum pressure allowed at Hanford site is about 350 psi. The pressure allowed at INL is 200 psi (full line pressure)

Training of personnel: Training should be easy; simple is better, site specific training should be identified

Environmental: Determine the volume of waste and waste characteristics.

Safety: Hazards to workers (pressure, temperature, moving equipment), radiation/contamination concerns

Compatibility with current systems: Corrosion, utilities, blinds / isolation of systems, new flanges needed

Operability: How complex, flexible (adapt to various systems), easy to operate

Reliability: Works consistently

Maintainability: Easiness to maintain, parts availability



Typical installation of Hydrokinetic™ System.

