

## EXAMPLE HAZARDS AND OPERABILITY ANALYSIS FOR A CHEMICAL PROCESS WITH ENERGETICS

LINE NO.	NODE/ OPERATION/ ITEM	DEVIATION/ FAILURE MODE	FAILURE CAUSE	POTENTIAL EFFECTS	SAFEGUARDS	HAZ CAT	RECOMMENDATIONS
1J	Solvent Recovery Water Dry Vessel	High level in solvent recovery watery dry area vessels	Overfilling of the solvent recovery water dry vessels or other vessels due to higher inlet flows than outlet flows, tank is already full prior to loading, operator error, control error, etc.	Injury or personnel Equipment/ facility damage	Feed to the solvent recovery water dry vessels is equipped with position transmission and indication to help ensure that the connection is made to the appropriate solvent recovery water dry vessel. The water return vessels will be equipped with level indication transmission and level indication	3D	None
1K	Solvent Recovery Water Dry Vessel	High level in solvent recovery watery dry vessels	Critical height is exceeded when the solvent recovery water dry vessels are filled	Propagation of an initiation (should one occur) to a detonation  Injury or fatality of personnel  Equipment/ facility damage	Even if the critical height of the propellant is exceeded, a detonation should not occur unless there is first an adequate energy stimulus in the proximity of the energetic material	1D	If the critical height is exceeded in any of the operations, ensure that potential energy stimuli in the area are eliminated or minimized (SAR NUMB-44)
1L	Solvent Recovery Water Dry Vessel	Exposure of personnel to hazardous operation	Personnel fall into the tank	Injury of personnel	Personnel should not be accessing the tank at frequent intervals  Personnel should be equipped with PPE	3D	Ensure personnel are protected from falling into the solvent recovery water dry tanks (e.g. rails, harness, etc.) (SAR NUMB-03)
1M	Solvent Recovery Water Dry Vessel	High temperature of energetic material	High temperature in the outlet from the activated carbon bed in the solvent fume extraction operation	Failure to condense solvents and release of hazardous solvent vapors resulting in injury of personnel and equipment/ facility damage	It is unlikely that severe injury or equipment facility damage will result from a temperature control failure on the outlet of the solvent fume extraction activated carbon bed	4D	Ensure that temperature interlocks are in place for the various heat exchangers to ensure target temperatures are achieved (SAR NUMB-38)