Using Vacuum Pumps

This SOP is for the use of the vacuum pumps and other similar equipment. A separate SOP is available for the use of vacuum distillation equipment, vacuum ovens, desiccators and the like.

Minimum PPE is standard plus safety goggles. Implosions are always a possibility when using systems and equipment under vacuum. If vacuum failure would result in chemical release, then the vacuum system should be in a fume hood. Appropriate gloves suitable for the contents should be worn.

Before subjecting the system to vacuum, inspect all parts of it for cracks or flaws. Ensure the seals are in good condition and all valves are adjusted for safe operation. In oil pumps, both direct drive and belt driven verify that the pump oil is clean and at an appropriate level (check the users manual). All vapors that have been pulled into the pump oil are going to be released out the vent port. When pumping down a system containing dangerous (corrosive, poisonous, otherwise hazardous) materials make sure that the vent port is venting into a hood, not the lab room. The foretrap is intended to protect the pump not the operator.

Systems that contain diffusion pumps have additional hazards. The diffusion pump should not be connected to the rest of the vacuum system until after the roughing pump had had a chance to thoroughly evacuate the vacuum system. After it has been verified that the roughing pump is operating correctly begin warming the diffusion pump (users manual for specifics) and connect it to the system. Always make sure the diffusion pump is separated from the system as it is shut down—hot diffusion pumps exposed to large quantities of air can explode. The specifics to what valves must be opened or closed, and in what order, vary from system to system. In hand built vacuum systems a specific SOP must be written so that all operators can both bring the system into and out of operation safely.

Aspirators are an inexpensive method of generating a vacuum but they require several steps to ensure their safe use. The water line must be able to generate both the necessary pressure and water flow for the aspirator in question (see the product data sheet for this information). Make sure the necessary water flow is still present after other likely needs are met. A rotary evaporator, for example, needs both a flow of cooling water for the condenser as well as a vacuum. Test the aspirator with the cooling line in operation or the system may fail in use. Most, but not all aspirators have a ball valve to prevent water backup into the vacuum system in case of radical pressure changes in the supply line.

Temporary systems should be disassembled as soon as practicable to prevent joint seizure and permit thorough cleaning between uses. Permanent systems should also be disassembled periodically for cleaning and inspection.