Using Vacuum Aspirators

This SOP is for the use of the vacuum aspirators and other similar equipment. A separate SOP is available for the use of vacuum pumps and another for 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.

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. A trap between the system and aspirator is a requirement if this backflow would cause a safety issue. The maximum vacuum attainable for a water aspirator is limited by the vapor pressure of the water generating the vacuum. As water’s vapor pressure is temperature dependent it becomes obvious that colder water will give a better vacuum. Water at 25°C has a vapor pressure of 32 mBar, while 15°C water has a vapor pressure of 17 mBar and 35°C water has a vapor pressure of 56 mBar. This becomes especially important in systems that recirculate the water being used, as the water warms over time, lowering the absolute pressure attainable. Also it must be kept in mind that any vapors that are not condensed by the system will end up in the water. Flammable vapors may build up in recirculating systems if this fact is not allowed for.