**SOP for working with the Vacuum line:**

Unit: Department of Chemistry/NAFUMA

Tasks: Use of vacuum lines

Date: 1/11-2010, Marc Enssle

* If you haven’t worked with a vaccum line, asked a experienced person!
* You **MUST** wear safety goggles if you work with the vacuum line!
* Control the glass flasks you use, they should be round and have no cracks! The wall of the glass flask must be thick enough for vacuum!
* If you fill in liquid nitrogen in the dewar for the cooling trap, use gloves and safety googles (see also “dealing with liquid nitrogen”, chapter 6.3. HSE-manual!)!
* Be sure that your apparatus is tight, check if all valves are closed! Never suck in air into the cooling trap! Oxygen can condense in the cooling trap!!
* **If you have a blue liquid in the cooling trap, it is maybe liquid oxygen. Open a valve, so that the oxygen can evaporate slowly. Make sure that there is no source of ignition close to the vacuum line. Close the fume hood or put a security glass in front of the vacuum line. Ask your collegues to leave the lab until all oxygen is evaporated.**
* **Same procedure for mixtures of liquid oxygen and organic solvents. Maybe contact the HSE coordinator.**
* The cooling trap protects the pump form chemicals, so use a cooling trap. If you remove the dewar from the cooling trap, make sure that the pump is separated from the vacuum line, so that no chemicals will be sucked in from the warming cooling trap in the pump.
* If you remove chemicals (eg. solvents or byproducts) from the flask, use a second cooling trap. This second cooling trap should placed between the flask and the vacuum line.
* If you suck in gases in the cooling trap, beware if you remove the nitrogen from the cooling trap. If you have a closed line you will get an overpressure in the line! Therefore you should open at least one valve.
* If you change the inert gas cylinder (see also “gas cylinders”, chapter 6.2. HSE-manual!) make sure that you use a pressure regulating valve, that reduces the pressure for 200 bar in the cylinder to 0.5 bar in the vacuum line. The vacuum line has an overpressure valve on the inert gas side.
* If you evacuate a flask, close the fume hood or put a security glass in front of the flask! **Flasks under vacuum may implode!**
* If you remove a reaction flask from the vacuum line, make sure that there is no vacuum on the flask. **Flasks under vacuum may implode!** Flush the flask with inert gas before removing it from the vacuum line.

SJA for working with the vacuum line:

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| **Subtask** | **What may cause an undesired event** | **Possible precautions** |
| Switching on the pump to evacuate the vacuum line. | The vaccum line has a damage and may implode! | Close the fume hood or put a security glass in front of the vacuum line before you switch on the pump. USE EYE PROTECTION. |
| Evacuate a flask. | The flask has a damage or small crack and may implode! | Place a security glass in front of the flask before you evacuate it. USE EYE PROTECTION. |
| Filling the dewar for the cooling trap with liquid nitrogen. Or removing the dewar from the cooling trap. | You have contact (skin/eyes) with liquid nitrogen. | Wear safety googles and gloves if you handling with liquid nitrogen!  Read chapter 6.3. HSE-manual “Dealing with liquid nitrogen.” |
| Sucking in air into the cooling trap. | You have a blue liquid in the cooling trap. This could be liquid oxygen! | Open a valve, so that the oxygen can evaporate slowly. Make sure that there is no source of ignition close to the vacuum line. Close the fume hood or put a security glass in front of the vacuum line. Ask your collegues to leave the lab until all oxygen is evaporated. |
| Sucking in air and chemicals into the cooling trap. | You have a blue liquid in the cooling trap. This could be a mixture of liquid oxygen and chemicals! | Open a valve, so that the oxygen can evaporate slowly. Make sure that there is no source of ignition close to the vacuum line. Close the fume hood or put a security glass in front of the vacuum line. Ask your collegues to leave the lab until all oxygen is evaporated. |
| Sucking in chemicals or gases (eg. Ar) into the cooling trap. | You remove the cooling trap, the chemicals or gases evaporated again. An overpressure results and the vacuum line may explode. | After removing the cooling trap, you open at least one valve, so that the gases can evaporate. Close the fume hood. |
| Replacing the inert gas cylinder. | You have no pressure regulating valve or one that wrong adjusted.  200 bars of pressure are on the vacuum line and it may explode. | Work ONLY WITH a pressure regulating valve. Adjust it to 0.5 bar. Be sure that there is an overpressure valve (which works!) in the vacuum line.  Read chapter 6.2. HSE-manual  “dealing with gas cylinders.” |
| Removing a flask from the vacuum line. | Vacuum is on the flask, the flask turn down and implode. | Never remove a flask under vacuum. Flush the flask with argon. |