

Procedure for Operating the Coalescence Test Apparatus in ASEC 81C

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START -UP

- 1) Open the lid to the Laskin nozzle and check the oil level. The oil level should fill about half of the tank. If it is low add SULLUBE 32 oil to it through opening the lid.
- 2) Check if the inlet and outlet tube connections to the Laskin nozzle are properly connected.
- 3) Check if the exit valve from the Laskin nozzle is fully closed. If not, turn it anti-clockwise to close it. Note that a substantial pressure is needed to seal the lid of the Laskin Nozzle tank. By closing the exit valve at start up then the pressure inside of the Laskin Nozzle tank can be raised until any leakage is stopped.
- 4) Disassemble the filter holder.
- 5) Clean the filter holder of any residual oil before placing the filter sample in the holder.
- 6) Put the aluminum plug in the holder and install the holder. Do not over tighten the aluminium screw because it will compress the cake and increase the initial pressure drop.
- 7) Check if the 5 drain valves on the test cell are closed, if not close them.
- 8) Check whether the following valves are fully open a) main air flow valve (after filter holder) b) valve at the discharging end (near flow meter).

- 9) Check if all pre-filters pipe connections and unions are properly tightened. The pressure regulator before the membrane filter should be fully open. If not, turn the valve clockwise to open it.
- 10) Check if all connections to the dryer and humidity monitor are properly tightened. The main gate valve after the dryer should be fully open and the needle valve (for humidity control) should be fully closed.
- 11) Check if there is excessive liquid in the two prefilters of the dryer. Manually drain them if necessary.
- 12) Check the connections to the differential pressure transducer. The two valves of the sampling port of the transducer should be closed.
- 13) Check the connections to the photometer. The 3 valves of the sampling port (zeroing, upstream and downstream) should be closed.
- 14) Connect the inlet air pipe of the dryer to the compressor.
- 15) If using the house air pressure, make sure the tube is properly connected and open the valve in room 81. If using the portable air compressor, fully open the valve of the discharging muffler connected to the air compressor. Start the compressor on auto mode not on the manual mode.
- 16) Wait till the readings of the two pressure gauges at inlet end stops rising. Slowly close the valve of the muffler. Watch the readings of the two pressure gauges in the pre-filter assembly rising. When the pressure approaches the experiment pressure, adjust the valve of the main stream (after the filter holder) and the valve of the muffler until designed experimental pressure and flow rate is obtained.

- 17) Check the apparatus for air leakage. Watch the pressure gauge to check for any fluctuations. If there is any air leakage, stop the compressor, relieve the system pressure, tighten the appropriate connection and go to step one.
- 18) Power on the temperature controller. Set appropriate temperature. Refer to the manual of temperature controller for details. **WARNING: AIR MUST BE FLOWING THROUGH THE SYSTEM WHEN THE TEMPERATURE CONTROLLER IS ON** (the thermocouple measures the air temperature at the filter holder. If the air is not flowing in the system then the thermocouple sends a low temperature signal to the controller and the controller sends more electrical energy to the heater. This can result in burning up the heater).
- 19) Power on the photometer, set reference and conduct zeroing procedure. Refer to the manual of photometer for details.
- 20) Power on the differential pressure transducer, current meter and DC power converter. The pressure transducer calibration should be checked once per year. Refer to the manual of pressure transducer for details.
- 21) Run the experiment for 20 minutes without opening the Laskin nozzle to clear out all particles from the system.
- 22) Open the valve of the particle generator to the maximum position (clockwise).
- 23) Adjust the valve on the main pipeline and the regulator of the assembly filter to get the designed flow rate and appropriate pressure difference across Laskin nozzle (25 psi).

24) If using the by-pass system to reduce the particle concentration upstream of the filter holder, adjust the third control valve (after the Laskin nozzle). Repeat steps 23 and 24 to get desired flows. Also, you may have to use the photometer or SMPS to determine the change in upstream concentration as the by-pass valve is adjusted.

DURING EXPERIMENT

- 25) Read the photometer (downstream) and pressure drop reading every 10 minutes. Use the photometer reading to indicate when the system reaches steady state (pressure drop also must reach steady state, but the particle concentration usually takes longer).
- 26) After 60 minutes, check each valve of the drain tubes for oil drainage every 10 minutes.
- 27) Drain and collect oil if there is liquid discharge from the tubes.
- 28) Check the drain pipe of the pre-filter of the dryer every 2 hours, if there is excessive water, drain it manually.
- 29) When steady state is reached, use the SMPS to measure the upstream and downstream particle size distributions. If necessary, the upstream flow sample may be diluted to avoid saturation of the detector.

SHUT DOWN

- 30) Close the valve of Laskin nozzle. Drain excessive oil from the drain tubes. Run the compressor for 10-15 minutes to flush out the system.
- 31) Turn off the temperature controller, photometer and pressure transducer. Make sure that the three valves for photometer are closed.
- 32) Shut off the compressor, relieve the system pressure.
- 33) Disassemble the test cell, remove the filter media, clean the test cell.
- 34) Lock the main power switch for the compressor.
- 35) Remove the connector pipe from dryer to the compressor.
- 36) CLEAN UP AFTER YOURSELF (YOUR MOM DOES NOT WORK HERE!)
Clean the area around the compressor and the experimental apparatus. Wipe up spilled oil. Empty trash can into larger trash can in ASEC 81.
- 37) Data analysis – remember to convert measurements into MKS units (you cannot publish English units). Your experiment is no good if you did not reach steady state.
- 38) Leave the apparatus in good condition for the next person to use. Note any problems in the Log Books for the Coalescence Experiment and SMPS.