MP 608 – Marshall, Michigan Incident
NTSB/PHMSA Information Request No. 35

35.12 **Reference:** Email Request

Preamble:

Request: **Explain how the relevance of a material balance alarm and column separation. What indicators are looked at by the MBS to make the determination that a material balance alarm or mass imbalance is a result of column separation? How long can a separation extend in a line? How is it brought back together? How is the air expelled from the line—are the lines full?**

Response:

Explain the relevance of a material balance alarm and column separation.

An MBS Alarm is a visual and audible message to the Control Centre Operator that a hydraulic imbalance has been detected by the MBS. The triggering of the alarm means that the MBS has detected an imbalance that is greater than the MBS threshold. There are multiple potential causes of MBS alarms and the cause is determined through analysis by support staff. The presence of a column separation is one of the causes of MBS alarms.

What indicators are looked at by the MBS to make the determination that a material balance alarm or mass imbalance is a result of column separation?

The MBS does not differentiate between an imbalance caused by a column separation from any other cause. The MBS is an indicator that an imbalance has been detected and the cause should be investigated. Analysis by support staff is required to determine cause of each alarm. MBS Support staff utilize the multiple displays in the MBS interface to investigate the cause of an alarm. When it is suspected that an imbalance detected by the MBS could be due to a column separation, the MBS Analyst should check one of the displays which shows the amount of liquid fraction of the entire pipeline. Under normal conditions (i.e. non column separation conditions), the liquid fraction line is equal to one (i.e. 100% liquid) along the entire distance of the pipeline. If the value of liquid fraction drops below one (i.e. less than 100% liquid) at any point along the pipeline it is an indication of a column separation at that location. If the location of the imbalance is congruent with the location of the column separation, the imbalance and therefore the MBS alarm may be attributable to column separations on the line.

How long can a separation extend in a line?
A column separation will be present in a pipeline as long as the pressure in the pipeline is less than the vapor pressure of the fluid. This could extend for days if a pipeline is shutdown under column separation conditions and left shut in for several days.

How is it brought back together?
A column is brought back together (or integrated) by increasing the pressure of the oil in the pipeline above the vapor pressure of the fluid. This is normally done through pressurizing the line with pumps.

How is the air expelled from the line – are the lines full?
There is no air in the line during a column separation. When depressurization of a section of pipe occurs and a column separation forms, some of the oil in the pipe is vaporized and moves from the liquid state to the vapor state. The pipe at this stage is no longer completely full of liquid as some vapor exists.

When the section of pipe is pressurized and the column separation is integrated, the oil that was in the vapor phase is pressurized above the vapor pressure and condenses back to liquid form, filling the pipe.