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| **Mass flow meter for Barge Oil Metering** |  |
| **Purpose:** Recommendations for improving the measurement accuracy in receiving material from barge. | |
| **Place:** VVF Ltd. Sewree | |
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| **Present Situation:** |
| * **Procurement:** 4 no’s Mass flow meters procured in 2001-2002 for barge oil measurement purpose at VVF Sewree Plant. * **Make/ Model:** Size: 3” 150# Emerson Micro motion. CMF 300 sensor 3700 batch controller transmitter. * **Accuracy:**  +/- 0.05 (CMF series) highest accuracy possible in Mass flow measurements. * **Present Location:** Out of four MFM sensor two are present in store and remaining  two are installed at Barge PL line area. However, at present pipe lines are modified and mass flow meters are not in line. |
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| **Installation faults:** |
| * **Isolation valves are not provided:**   Zero checking of meter and its isolation for certain higher viscosity fluids is not possible.   * **Horizontal installation:**   As Mass flow meters are used for multi service application, fluid inside material is unable to drain itself.   * **Orientation for such large flow:**   For 6” line size two mass flow meters of 3” is used, but flow cannot not divided equally in both meters due to 90 deg. installation to inlet pipe   * **Many sharp bends:**   Before mass flow meter many piping bends increases pressure drop (we already using 3” meters for 12” line flow) |
| **Checking of Mass flow meter:** |
| * Initial checking of Mass flow meter sensor & transmitter is completed. * Out of four mass flow meters transmitters’ two batch controller is working. |
| **Note: For more reliable accuracy testing we have to carry out sensor smart verification test from OEM.** |
| **Bypass MFM for higher viscosity material** |
| * As material having viscosity above 40 cp is having very less frequency. * Also, it required higher size of mass flow meter and it gives more pressure drop across meter, which requires higher cost. * As it is having less frequency of operation we are suggesting avoid use of mass flow meter for this fluids. |
| 1. **Material received at Sewree having viscosity below 40 cp @ 40 Deg c** |
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| **Sizing sheet for Mass Flow meter:** |
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| **Summary of Sizing**:. |
| Two 3 inch Mass flow meter is required for one PL line.  If we consider viscosity 40 CP then pressure drop will be maximum 0.5 kg/cm2 across meter and if consider 450Cp then pressure drop will 1.8 kg/cm2 across meter.  Therefore we are not considering higher viscosity material in sizing & not metering. |
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| **Suggestions:** |
| * Isolation valves needs to provide for mass flow meter zero checking. * Many sharp bends are present for mass flow meter. Needs to remove and possible straight run to be maintained. * Sizing of mass flow sizing needs to check as flow of 12 “ line is going to 3” Mass flow meter (Which may be reason of higher pressure drop and sensor failure). * If we can provide buffer tank before mass flow meter then it will reduce malfunction of mass flow due to air or dual phase. * NRV below buffer vessel required to avoid reverse flow. * Vertical installation of mass flow meter for self-draining which essential multiservice application. Also it ensures full filling mass flow meter tube for more reliable reading. |
| **Proposed PFD & operation:** |
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| **Proposed Line of flow**   * As from barge material flows with air, to avoid inaccurate reading of mass flow meter due to dual phase, buffer vessel is proposed. * Required Buffer tank capacity is of 300 ton, which will store at least 2-3 hrs. Material which is coming from barge. (Mass flow meter rate is 80 to 100 tons /hr.) * Level Transmitter required at tank top for tank level indication & necessary automation control. * In Pigging operation at about 40 Ton material is present in pipe, which also can be transferred through MFM. |
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| **Additional Automation:**   * Level Transmitter is required on buffer tank. * For buffer vessel high level provided with Inlet on off valve will close to ensure spilling over of buffer vessel. * On Low level of Level Transmitter it will trip outlet pump. |
| **Conclusions:** |
| * For higher viscosity material don’t use mass flow meter. Mostly from PL-2 higher viscosity material is taken so install mass flow meters only in PL-1 & PL-3 * Use different buffer vessels for PL-1 and PL-3 at Sewree barge receiving point. As from PL-3 we are receiving only white oils. * Use of two 3 inch mass flow meters with vertical installation for single PL line, which are already available , for 2nd line we can use single 4” mass flow meter for new procurement. |