



TOP 8 PROBLEMS WITH SAMPLE FLOW TO ON-STREAM ANALYSERS

For the on-stream analyser to operate correctly, good sample representativity is critically important. Sample line routing, sizing, sampler location, and correctly installed sampling equipment all have an influence on the representativity and reliability. This article discusses typical problems with sample flow and the recommended solutions.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
1. Sample flow does not start	Closed valves	<ul style="list-style-type: none"> Check the valves are open.
	Blockages in the sampler cutter or nozzle	<ul style="list-style-type: none"> Check the sampler cutter or nozzle for blockages. Remove the blockages if found.
	Kinks in rubber hoses due to a bend or negative pressure	<ul style="list-style-type: none"> Use only kink-resistant rubber hoses that can withstand negative pressure.
	Sample line route to the multiplexer goes above the zero pressure point of the process line	<ul style="list-style-type: none"> Re-route the sample line so that the line does not go above the zero pressure point of the process line. The sample line should not go higher than the process line (refer to Fig. 1)

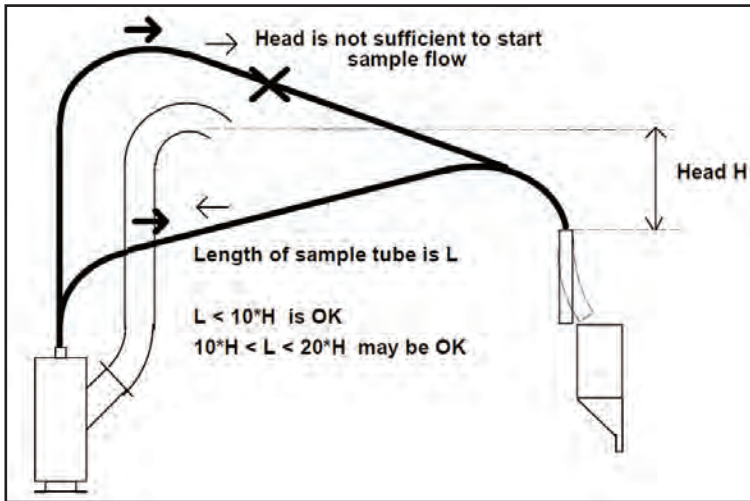


Figure 1: Recommended routing of sample line for pressure pipe sampler

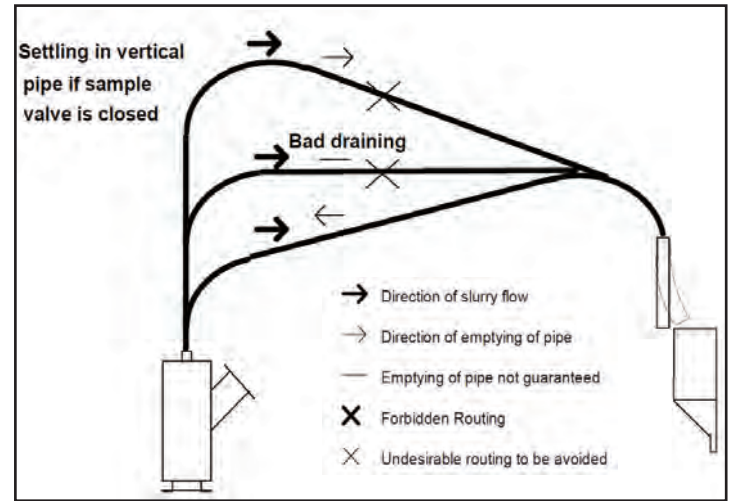


Figure 2: A recommended sample line (lower) and line requiring controlled on-demand sampling (upper lines)

<p>2. Flow starts well but decreases slowly, often stopping completely</p>	<p>Flow velocity is not high enough to prevent settling in the pipe. Solids settled on the bottom of the pipe constrict the pipe.</p>	<ul style="list-style-type: none"> • Increase the head. A pump can be used to provide a sufficient head. • Alternatively, shorten the sample line. • Or use controlled on-demand sampling with regular flushing. Flushing valves can be manual or automated.
<p>3. Sample flow rate decreases slowly in a pressure pipeline</p>	<p>The sample pipe has a steep downhill slope which slowly turns the pressure flow into a gravity flow. Air may leak in from the sample line discharge or be carried by the slurry. Eventually the solids settle and block the pipe.</p>	<ul style="list-style-type: none"> • If air leaks in from the sample line discharge, add a flow decelerator or another airlock in the piping to prevent air intake from the discharge. • If the origin of air is the slurry itself, decrease the slope to prevent accumulation of air. • If other corrective actions are not feasible, use controlled on-demand sampling to remove air from the piping i.e. sequenced sampling, including automated water flushing before and after samples are taken.
<p>4. Sample flow rate decreases slowly in a gravity pipeline</p>	<p>The pipeline contains horizontal or nearly horizontal sections in which the pipe fills up and the gravity flow turns into a pressure flow. This reduces flow velocity and causes settling of the solids.</p>	<ul style="list-style-type: none"> • Engineer a continuously sloping sample line that contains no horizontal or nearly horizontal sections. • If it is not possible to build a continuously sloping pipeline, use controlled on-demand sampling (refer to Fig.2).

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
<p>5. Flow rate decreases in a sample line with a pump providing additional</p>	<p>There is no pump sump before a horizontal pump, and the pump may cause negative pressure before the pump which closes the pinch valve at the pump.</p>	<ul style="list-style-type: none"> Decrease the speed of the sample pump to reduce the flow rate and negative pressure at the pinch valve.
<p>6. Too low sample flow rate from the start</p>	<p>A mistake in engineering or in installation (Installation has not been done according to the engineering plans).</p> <p>If the process flow rate is very low, it is possible that the sample flow rate may intentionally have been designed to be low as well.</p>	<ul style="list-style-type: none"> Compare the actual installation with the engineering design and the data the design is based on. Make possible easy corrections to the installation. Consult the sampling engineer and Outotec (as necessary). Look for constrictions in the pipeline, such as partly deflated hose bends and internal pipe joints. If found, remove these constrictions. If the sample flow rate has intentionally been designed as low, there are no corrective actions to be taken. If no easily correctable mistakes can be found for a pressure pipeline, increase the inner diameter of the sample line and/or decrease the pipe length.
<p>7. Too high sample flow rate in a gravity pipeline</p>	<p>Process pipe or launder is so full that the cutter acts as an airlock and turns the sample line into a pressure pipeline.</p> <p>Process flow rate is higher than the designed flow rate of the sampler.</p> <p>The cutter opening has worn wider over time.</p>	<ul style="list-style-type: none"> If there is no pressure at the sampling point, eliminate the effect of the airlock by installing a clear break in the pipeline or large breather pipe (>100mm in diameter). If there is pressure at the sampling point, treat the sample line as a pressure line and ensure that the correct sample line inner diameter has been selected. Reduce the size of the cutter opening. This solution works for the following types of samplers viz. LSA, NLA, LSA- NC, and SKA. Check the sampler cutter and replace it as necessary.
<p>8. Too high sample flow rate in a pressure pipeline</p>	<p>The head/length (H/L) ratio is too high.</p>	<ul style="list-style-type: none"> Decrease the inner diameter (ID) of the sample pipe, but not below 25 mm, because too small ID increases the risk of blockages. Increase the length of the sample line to increase friction losses. Do not decrease the flow rate by reducing the nozzle. Nozzle reduction will make the nozzle wear rate high. Sampling will not be isokinetic, and the sample will not be representative of the process stream. Do not decrease the flow rate with a sampler valve or by any other short constriction. It will increase flow velocity and make the wear rate very high at the constriction.