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Optimizing the HIAC 8011+ Particle Counter for analyzing Viscous Fluids



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10/24/2015

There are 3 primary elements that directly impact the HIAC 8011+'s ability to analyze viscous fluids; sensor aperture size, flow rate, and the 8011+ instruments pressure settings. Configuration design options and internal operator selectable features will optimize the instrument to allow measurement capability across a wide range of fluids and viscosities.

Introduction

A challenge for many industrial applications is finding a Liquid Particle Counting instrument that has the capability of running not only a wide range of fluid types and chemistries, but also a wide range of viscosities. With some fundamental system configuration considerations and utilizing the feature setup flexibility of the HIAC 8011+, optimization is “so easy a Caveman could do it”.

1.0 Sensor selection

This is a critical first step when designing your system for your application. Below in Table 1 there are 4 important considerations for selecting your sensor.

1. What calibration type is appropriate to report my results? I.e. ISO, NAS, or SAE codes?
2. Do I need High concentration sensor as I am running dirtier fluids?
 - a. High Concentration sensors have a published concentration limit of 18,000 counts/ml.
 - b. Standard Concentration sensors have a published concentration limit of 10,000 counts/ml.
3. Do I need to have my sensor calibrated at multiple flow rates to accommodate both low and higher viscosity fluids?
4. Is the sensor aperture size the largest possible to accommodate the heavier fluids?

Sensor Model	Calibration options			Flow rates (ml/minute)	Aperture size
	ISO-MTD	ACFTD	PSL		
HRLD100	X	X	X	10, 20, or 60	400 x 1000 μm
HRLD100HC	X	X	X	10 or 20	400 x 400 μm
HRLD400		X	X	10, 20, or 60	400 x 1000 μm
HRLD400HC		X	X	10 or 20	400 x 400 μm

2.0 Flow rate selection

Regarding more viscous fluids, the lower the flow rate, the easier it is to regulate the flow through the system. The most prudent option is to have 2 calibrations performed: one at the slowest flow rate and one at the fastest flow rate allowable for your particular sensor. This allows the ability to successfully measure the entire range of fluids within the HIAC 8011+ system specifications. An important takeaway is that with the multiple sensor flow rate capability, you can select a calibration with a faster flow rate when running the thinner fluids to improve efficiency with daily throughput.

3.0 Pressure settings

Pressure is important in this system as it is used as an aid to degassing the sample, and in the case of more viscous fluids will assist the internal precision metering pump to push and regulate the flow rate of the heavier fluids during sampling. There is a pressure regulator valve mounted at the lower left on the front panel of the HIAC 8011+ as indicated in Figure 1 below. Clockwise adjustment of this knob will increase the chamber pressure during a test run. The maximum pressure setting for the system is 90 PSI. The other setting is the initial start pressure which is parameter that is chosen within the instrument setup menu. This setting establishes the point at which the sample measurement will begin. If heavier fluids are being measured it is recommended that this setting be set to ~ 5 PSI less than the chamber pressure setting. This allows the pressure chamber to achieve a minimum pressure level that will allow accurate flow regulation of the heavier fluids right from the beginning of the sample.



Figure 1

Conclusion

A typical HIAC 8011+ system configuration and set up:

HIAC 8011+ with an HRLD100 sensor calibrated at 2 different flow rates; 10ml and 60ml per minute. The operator would adjust the pressure regulator to 80-90 PSI and set the initial start pressure within the instrument setup menu to 5 PSI less than the Chamber pressure setting.

Rationale: The HRLD100 sensor can be calibrated with the NIST traceable ISO-MTD, but also with ACFTD if necessary so would be able to report out appropriately to any industrial reporting standard. It has the largest aperture which is friendlier to the heavier fluids, and can be calibrated at the lowest and highest flow rates of the sensors listed.

About the author



Bill F. Bars is a Sr. Application Scientist for Beckman Coulter Life Sciences in Grants Pass, Oregon, USA. He has created and developed many of the liquid systems production processes and procedural tools for the BEC Particle products. These products include but are not limited to the following HIAC branded products: 8011+, PODS, GlyCount, 9703+, ROC, and HRLD Sensors. He has worked for Beckman Coulter Life Sciences for 19 years in a multitude of engineering capacities ranging from Metrology to Service Training and Application Support. He is a member of the NFPA U.S. TAG to ISO/TC 131/SC 6 - Contamination control group. Email Bill F. Bars at: bbars@beckman.com

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