

S.J. SMITH CO.



ARGON MAXIMIZER™ FOR LIQUID CYLINDER FILLING

CASE STUDY #7

Customer Project Description

A major gas and equipment distributor, S.J. Smith located in Davenport, Iowa fills high pressure and liquid cylinders for the industrial gas market. At one of their main fill plants located at 3707 West River Drive, S.J. Smith has upgraded their bulk storage for atmospheric gases (LIN, LOX & LAR) to the Siphon 100™ bulk tanks. In addition, S.J. Smith has added their own Lo-Loss liquid cylinder filling systems to all three of these gases to upgrade their filling efficiency to today's standards.

Test Challenges

To add the new Argon Maximizer liquid cylinder filling system to their existing argon filling station and test it to determine its cost-benefit value. With the high cost of Argon and the potential for future shortages, conserving argon molecules has become a major cost reduction program for S.J. Smith. The Argon Maximizer from Chart is designed to further enhance product savings beyond the Lo-Loss system. This is achieved by reducing argon losses during the liquid cylinder filling process before the liquid passes through the Lo-Loss system. The Maximizer's internal heat exchanger reduces the saturation pressure of the "hot" argon as it passes through a bath of liquid nitrogen. Hence, the lower-cost nitrogen is sacrificed to further reduce the argon liquid cylinder filling losses.

Test Solution

The Argon Maximizer is installed between the Argon bulk tank and the Lo-Loss system. Because the inner vessel of the Maximizer stores the liquid nitrogen for cooling the argon, it must also be connected to the bulk nitrogen tank. To facilitate the data gathering, pressure, level and temperature sensors are installed in many strategic locations. Each sensor is then wired to a central data acquisition system for detailed information monitoring throughout the equipment testing process. To compare the two processes, liquid cylinders are filled with only the Lo-Loss and with the Maximizer & Lo-Loss. A total of 197 liquid cylinders were evaluated over a three month period to gather significant data for comparison.



Argon Maximizer Plumbing



Lo-Loss & Argon Maximizer Installation

S.J. SMITH CO.

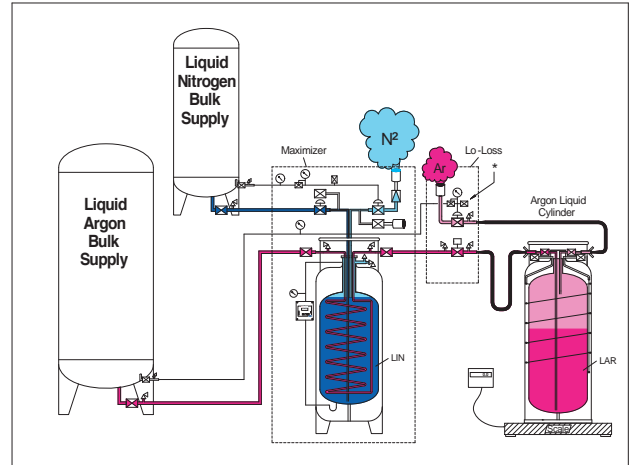


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Field Test Summary				
	Units	Lo-Loss Only	Lo-Loss w/ Argon Maximizer	Savings
Qualified Liquid Cylinder Fills	(#)	27	65	
Average Argon Bulk Tank Pressure	(psig)	42	52	
Argon Liquid Cylinder Ending Pressure	(psig)	22	10	
Argon Pressure Reduction	(psig)	20	42	
Argon Flow Rate	(lbs/min)	18	25	
Argon Fill Times (500 lbs LAR transfer)	(min)	27	20	7 min
Argon Losses	(lbs)	65	15	
Argon Losses	(SCF)	628	145	77%
Nitrogen Consumed During Argon Transfer	(lbs)	NA	75	
Nitrogen Lost During Maximizer Filling	(lbs)	NA	15	
Total Nitrogen Losses	(SCF)	NA	1240	
Argon Cost (\$/100SCF)			\$4.00	
Nitrogen Cost (\$/100SCF)			\$0.40	
Argon Losses (500 lbs LAR transfer)	(\$)	\$25.10	\$5.80	77%
Nitrogen Losses (500 lbs LAR transfer)	(\$)	NA	\$4.96	
Total Losses (500 lbs LAR transfer)	(\$)	\$25.10	\$10.76	\$14.34
Argon Liquid Cylinders Filled	(#/month)		50	
Maximizer Savings	(\$/month)		\$717	
Maximizer Cylinder Filling Time Savings	(min/month)		350	

Notes: Losses do not include liquid cylinder initial cool down. Majority of liquid cylinders were Dura-Cyl MPs.



*Note: Lo-Loss shown with 50 psi final cylinder pressure kit.

Benefits

Among the many benefits S.J. Smith now enjoys with the Argon Maximizer permanently installed, three stand out:

1. The argon losses per liquid cylinder are reduced by 77%
2. The overall filling costs per liquid cylinder are reduced by \$14.34
3. The average fill times per liquid cylinder were reduced by 7 minutes (25%)

S.J. Smith did observe another key benefit of the Argon Maximizer: delivering a lower pressure liquid cylinder to their customer. It should be noted that the liquid cylinder average final pressure was 10 psig when the bulk tank averaged 52 psig. If only the Lo-Loss were used, this would have been 32 psig (20 psi differential). A minor improvement, but if the bulk tank was at a higher pressure, a "cold" liquid cylinder at 10 psig would still result. For further details on the Argon Maximizer performance, see product specification sheet, PN 14084621.

Results

The data above reflects the before and after results S.J. Smith experienced from adding the Argon Maximizer to their argon liquid cylinder filling station. In addition to the financial benefits the Chart Argon Maximizer system brings to S.J. Smith noted above, several other operational benefits also became apparent. By reducing their fill times, S.J. Smith can improve their throughput and reduce their overall labor at this station. With a significant reduction of argon saturation pressure in the liquid cylinder after the fill, S.J. Smith can now be confident of delivering "cold" liquid cylinders to their customers regardless of pressure fluctuations in their bulk tank. This will eliminate customer complaints from cylinders "popping off" early when stored for inventory at the customer site.

Customer Quote

Eric Smith, Operations Manager, noted, "At first I was concerned about achieving a significant return on capital investment & training due to process changes when adding the Argon Maximizer. But after our experience, it is worth the investment and time to understand the value it can bring to our liquid cylinder filling process for argon liquid cylinders. The Maximizer works as advertised."

Credits

S.J. Smith employees Eric Smith, Wayne Brimeyer, Darin Brinkman, Bill Krebs and Dave Dexter participated in this case study.