

Practical Solutions for Today's HSE Challenges

How Partial Stroke Testing Helps Keep a High SIL Rating

Operating companies can substantially increase their SIL (safety integrity level) loop rating if they adopt a rigorous maintenance and testing program on their valves. By combining partial stroke testing of valves with more frequent inspection, companies can achieve higher SIL rating without spending for additional hardware.

The proof is in the numbers.

The table below (Table 1), based on published data for ESD/PSD valves, identifies the type of failure. The second column in the table identifies the failures a stroke test would detect. No letter in the second column indicates that neither a full nor partial stroke test would identify the failure.

Table 1 - Value Failure by Type

Type of Failure	Partial / Full	% Breakdown	Partial Stroke Test	Full Stroke Test	Undetectable by any Test
Blockage/plugged	F	1.56		1.56	
Contamination	P	0.31	0.31	0.31	
Control Failure	P	3.43	3.43	3.43	
Electrical failure - general	P	0.31	0.31	0.31	
Faulty signal/indication/alarm	P	1.25	1.25	1.25	
Instrument failure - general	P	4.98	4.98	4.98	
Leakage	F	6.54		6.54	
Material damage	F	2.18		2.18	
Material deterioration *	F	50.78		50.78	
Material failure - general	P	7.17	7.17	7.17	
Mechanical defect	F	8.10		8.1	
Mechanical failure - general	P	0.93	0.93	0.93	
No signal/indication/alarm	P	1.56	1.56	1.56	
Out of adjustment	F	0.62		0.62	
Design/operator related causes		0.31			0.31
Operator errors		0.62			0.62
Unknown		9.35			9.35
Total		100.00	19.94	89.72	10.28

* Standard partial stroke testing will not test deterioration

Partial Stroke Testing & SIL Rating (Cont'd)

Traditional thinking is that a full stroke test is necessary to maintain a high SIL rating. This often means production interruption or redundant valves, increasing lifecycle costs or capital costs. Suddenly the benefits of using SILs are offset by the higher hardware and lifecycle costs.

ACM's approach is different, and cost effective.

ACM recommends that companies utilize partial stroke testing and incorporate a valve inspection and maintenance program that will detect slow materials degradation. This will result in companies being able to detect 78.82%* of all preventable valve failures without the costs inherent with production loss or redundant valves.

Similar to a pump, a valve will show signs of wear and tear. A normal pump curve will show when an impeller is about to fail. Correspondingly, if histories of all valve tests are documented with appropriate factors such as time required for the valve to leave its seat, the pneumatic pressure required releasing the valve, the pressure needed to return the valve to its seat, etc., a profile can be created to identify the degeneration of the valve.

The end result of this combined partial stroke test and heightened maintenance and testing program provides for high SIL ratings for less cost. ACM often hears clients state that SILs are a good thing, but that they do not like to spend extra capital to achieve those SILs. Partial stroke testing provides a good solution.

* 78.82% is the result of adding 50.78% & 19.94% and dividing by the 89.72% of detectable valve failures.

Corporate Information

ACM engineers safer energy projects worldwide. We provide objective third party safety and automation expertise to Canadian and international clients, including oil and gas producers, engineering companies and vendors in the heavy oil, pipelines and terminals, offshore, petrochemicals, upstream oil and gas processing and telecommunications and utilities sectors.

Corporate downsizing and emphasis on "just in time" resourcing mean clients often face critical timelines yet lack the exact expertise needed for a project. ACM provides experienced project managers and technical specialists in Process Safety, Safety Engineering, Loss Management, SCADA Engineering and Telecommunications.

To discuss how ACM can bring value to your organization, please contact Murray Macza via phone at 403 264 9637 or email at murray.macza@acm.ab.ca

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