

# Operation and Benefits

## OF THE MICRO-GAP® VALVE

There are major differences in operation, wear and performance between the Micro-Gap® homogenizing valve and any conventional homogenizing valve. This bulletin will attempt to summarize the important differences.

### Required Operating Pressure

The Micro-Gap valve enables the required pressure to be reduced, while producing the same emulsion particle size. When date-coding a product for 10 or 11 days, a pressure of 1250 psi with the Micro-Gap will produce an average particle size of 0.85 micrometer ( $\mu\text{m}$ ), as measured by a Gaulin EQA analyzer. This would require 1800 psi with a conventional valve. Conversely, if the date code is 12 to 14 days or longer and the average particle size is larger than 0.75, a cream layer will occur. Achieving a particle size 0.75 or smaller would require operating at 1500 psi with a Micro-Gap valve and a minimum of 2200 psi with a conventional valve.

### How It Operates

When the hydraulic pressure is applied to a Micro-Gap valve stack, the springs are compressed and the valves are metal-to-metal on the outside diameter. In this condition there is a fixed, non-variable gap of 0.0015 inches per valve. It is this narrow gap and narrow land or flat that produces the better quality emulsion. A flow restrictor (orifice) is attached to the discharge flange of the Micro-Gap assembly, the purpose of which is to generate a backpressure of 10% of the total operating pressure (100 to 150 psi). This backpressure intensifies the cavitation and turbulence in the first-stage valve.

The springs prevent lateral movement or misalignment of the valves. They also facilitate cleaning by uniformly opening all the valves when the HVA pressure is removed.

As the valves wear over a period of months, the gap between the top two valves must be gradually reduced to maintain the same total area for flow. This requires slightly more HVA pressure to deflect the top valve. See Service Bulletin #1 for required HVA pressure and wear recording procedures. When required HVA pressure is 1000 psi, the valves need replacement. ***Exceeding 1000 psi HVA pressure will result in cracked valves.***

### Expected Valve Life and Regrinding Procedure

Based on 80 processing hours a week and if properly maintained, cleaned and not damaged by excessive HVA pressure, operating hours for Micro-Gap valves on fluid milk operation (no undissolved solids such as whey, cocoa or sugar) should be greater than 3000 hours or 8 months, before regrinding is needed. In the case of a homogenizer used for both fluid milk and some by-products, 1500 to 3000 hours should be expected. For more abrasive products containing undissolved solids, chocolate milk or ice cream mixes for example, 1000 to 1500 hours should be expected. See Technical Bulletin #76, "Micro-Gap Valve Applications and Recommended Operating Pressures". Due to the critical tolerances involved, do not attempt to regrind the Micro-Gap valves in the field. Contact the APV Homogenizers Parts Department for return and regrinding<sup>1</sup>.

ANNUAL COST <sup>2</sup>							
FUILED MILK - 3000 HOURS/SET (8 MONTHS)				BY-PRODUCTS - 1500 HOURS/SET (4 MONTHS)			
CAPACITY (GPH)	# OF VALVES	# OF REGRINDS PER YEAR	COST/YEAR	CAPACITY (GPH)	# OF VALVES	# OF REGRINDS PER YEAR	COST/YEAR
4000	5	1.5	\$700	4000	5	3	\$1400
6000	8	1.5	\$1150	6000	8	3	\$2300
8000	10	1.5	\$1400	8000	10	3	\$2800

COST OF REPLACEMENT VALVES <sup>2</sup>					
FUILED MILK - REGRIND 1-1.5 SETS/YEAR (1.5/10 X NO. OF VALVES X \$500 PER VALVE)			BY-PRODUCTS - 1500 HOURS/SET (4 MONTHS)		
CAPACITY (GPH)	# OF VALVES	COST/YEAR	CAPACITY (GPH)	# OF VALVES	COST/YEAR
4000	5	\$400	4000	5	\$750
6000	8	\$600	6000	8	\$1200
8000	10	\$750	8000	10	\$1500

Assuming 4500 hours per year of operation, a product with little or no cream layer and a 14-day code, the energy cost to produce a 0.75 particle size (standard valve at 2200 psi or Micro-Gap at 1500 psi) would be:

$$\$/\text{yr} = \frac{\text{volts} \times \text{amps} \times \$/\text{kwh} \times \text{hr}/\text{yr}}{1000}$$

<sup>1</sup> Normally, valves can be Factory-reground ten times.

<sup>2</sup> Based on 4500 hrs/yr and regrounding cost of \$95.00 per valve.

ENERGY COST PER YEAR				
CAPACITY (GPH)	@ .05 \$/KWH		@ .10 \$/KWH	
	STANDARD \$ VALVE	STANDARD \$ VALVE	STANDARD \$ VALVE	STANDARD \$ VALVE
4000	15,750	10,700	31,500	21,400
6000	23,600	16,100	47,200	32,200
8000	31,500	21,500	63,000	43,000



611 Sugar Creek Road, Delavan, WI 53115

P: (262) 728-1900 or (800) 252-5200, F: (262) 728-4904 or (800) 252-5012, E: wcb@spx.com

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