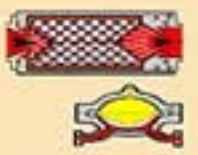
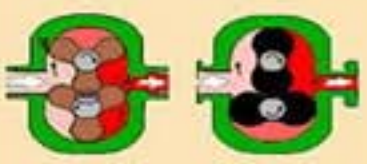
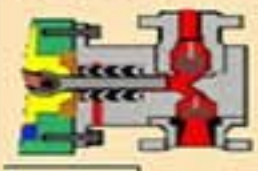
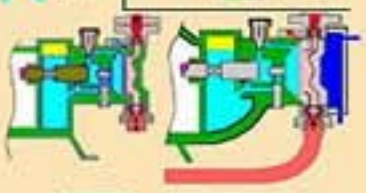
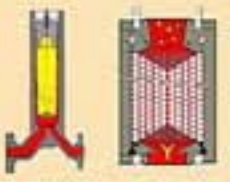
CONTENTS

DAMPER PRE-SELECTION TABLES BY PUMP & CONNECTION

PUMPS make FLOW, SYSTEMS make PRESSURE, pressure pulsation is system response to flow fluctuations from valves etc., system response is a SYSTEM RESPONSIBILITY, Not a Pump Vendor liability. "Close coupling", THERE IS NO SECRET - SAVE HALF THE COST, BY HOW IT IS PIPED.

Type of Pump	SYSTEM RESPONSE; FOR DAMPER SELECTION	Pump Piping System	Solutions	Page Key
	Pressure "Pulsation" comes from the reverberation of the start-up surge, its frequency is from the pipe length The amplification of high frequency from the flutes by the pipe system, is addressed by acoustic de-coupling.	CENTRIFUGAL SINGLE & MULTI-STAGE, "CANNED" & "MAG-DRIVE"		P3 P4
	When pipes are larger than necessary for 2 to 10 ft/Sec. flow velocity (according to cP.) there is no amplitude dissipation; audible whine, & with long pipes "shake", may occur. An acoustic decoupler will generally suffice.	VANE AND POSITIVE DISP-LACEMENT FLEX-IMPELLER		P5 P6
	Pipes attached to gear pumps with 7, 11, or more teeth driven @ 300 rpm & above, need high frequency and acoustic protection. Lower frequency, & larger volume systems, from internal gears, need volumetric damping.	GEAR, SPUR, NORMAL & "INTERNAL"		P7 P8
	Low amplitude medium frequency, often viscous, flow fluctuations and system response pressure pulsation, is addressed by in-line flow-thru. interception which also provides in place flushability before service.	TWO LOBE AND THREE LOBE		P9 P10
	Larger long pipe systems 10" through 30" respond by jumping. To prevent weld cracking, and pipe fatigue. cushion chambers, through which the material flows, are used.	SCREW AND "AUGER" MESHING OR GEARED		P11 P12
	The higher the viscosity the greater the effect of drag and the less well the feed end is filled. this causes pipe pulsation from what is otherwise a smooth flow. Flo-thru. dampers dampen what would go past a T.	PROGRESSIVE CAVITY AND WORM		P13 P14
	When the shoe or roll mashes the hose a shock goes back up the suction line. When it lifts off the discharge end of the pump hose, a void occurs, liquid rushes back, pressure falls. Dampers are relative to shoe size.	HOSE, TUBE AND PERISTALTIC		P15 P16
	Squashing the straight tube is progressive and gentle, Lift-off is progressive also. Dampening a Track Hose is almost unnecessary. Allow for the higher pressure capability of tube in tension "Track-Hose" pumps.	TRACK HOSE UBERFLUSSIG-PROGESSIVKET-TENPFEIFE	 Exceptional pump refer to manufacturer	
	The time delay of direction change, governs damper size. The essential is a large air hose to drive the pump With large air supply, the pulse to be filled is only one sixth of the volume displaced per stroke per end.	AIR OPERATED DOUBLE END DIAPHRAGM A.O.D.e.D.		P17 P18
	The most volumetrically efficient of all pumps, due to the minimal dead volume , (unswept by the plunger) between the check valves. They emit virtually no velocity jump shock. Only flow fluctuation removal is necessary.	PACKED PLUNGER FIXED AND VARIABLE Stroke		P19 P20
	The benefits of hermetically sealed displacement, plus the efficiency and no shock of a packed plunger. With cost savings and longer diaphragm life. Small flow-through in place flushable dampers - that is it.	DIAPHRAGM SEALED, METERING PACKED PLUNGER	 Exceptional pump treat as similar to Packed Plunger	
	Liquid is compressible. Otherwise the velocity of a pressure wave would be infinite. Because process liquids are often very compressible, & pipework "happens" isn't designed, velocity jump shock and system pulsation can be massive.	DIAPHRAGM (MULTI LAYER) METERING, RPM or STROKE VARIABLE		P21 P22
	Decrease in con-rod length, increase in rpm, weight of check valves, all increase the amplitude of pulsation. Increased number of plungers, decreasing check valve travel to 0.25 x throat Diam. less dead volume, all help.	POWER PUMPS, MULTIPLEX-"674" TRIPLEX, QUIN SEPTUPLEX etc.		P23 P24
	A "continuous" stream is deliverable to a "static" mixer from the intermittent shots so inexpensively produced by solenoid or cam stroked "lost motion on back stroke" dosing pumps, with a damper only 10 x the stroke volume.	DOSING, LOST MOTION VARIABLE BACK STROKE	 PeG-Plas Plastic Wetted Parts Full Metal Support PeG-Lnd. Elastomer Linings, same Material As The Bladder	P25 P26
	Damping in HP injection & test intensifier systems is more akin to decompression shock interception than volumetric flow fluctuationremoval. The suction stroke is usually fast. Both suction & discharge need the "Flo-Thru" approach.	FLUID DRIVEN INTENSIFIERS & INJECTORS		P27

Housing/Casing	Metals : Stainless, Duplex, Super Dupx A20, HC276, Tit .2, Tantalum Zirconium Etc.	PLASTICS examples P.V.C. Poly Propylene	Dupont "TEFLON" (Virgin) V-PTFE (Modified) M-TFE FlexFlon Ceramic Balls	Cooling / Heating Jacket Fluid or Transfer liquid in Food & Drug "Piggy Back" units.	In presence of any lube oil or Hydro--carbon, N2 Nitr-ogen is mandatory Otherwise Air	LIQUID Higher Pressure / Lower Pressure / Suction & sub-Atmospheric
Drive Fluid						

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GAURDS AGAINST PULSATION

PUMPS make FLOW, BUT SYSTEMS make PRESSURE, PULSATION is a system pressure response, and a SYSTEM RESPONSIBILITY, not a pump manufacturer liability.