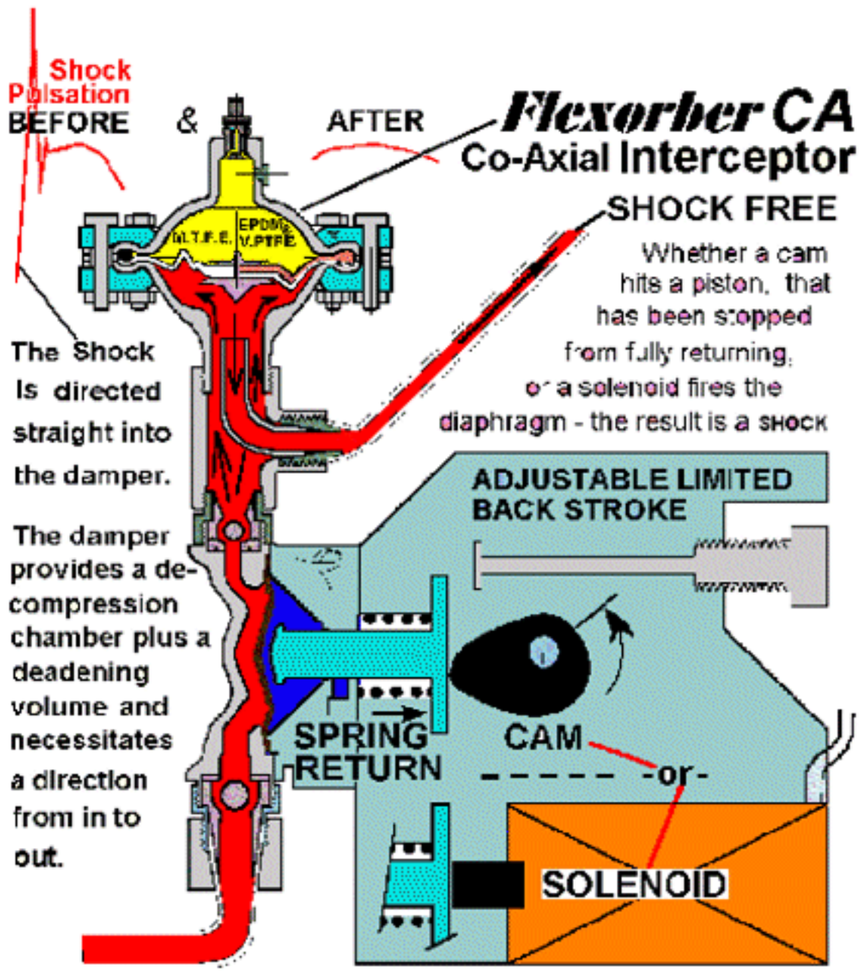
SHOCK ALLEVIATION

Lost motion, or low volumetric efficiency - & the "velocity jump" or "The Joukowski shock"



From the cover photo C.

When the beginning of the forward stroke does not displace any liquid, a pressure shock is emitted, instead of a flow surge.

The shock is caused by the acceleration away from "bottom dead center" before it hits solid liquid.

This acceleration without pumping liquid is caused in 3 ways:

1. Expansion of compressible liquid left from the last discharge stroke, stopping the pump filling properly on its suction stroke.

2. Volume control by limiting back stroke, as in some cam drives.

3. Instant action as from a solenoid drive.

The shock from all three occurs too fast, for an off line flow smoother to catch it.

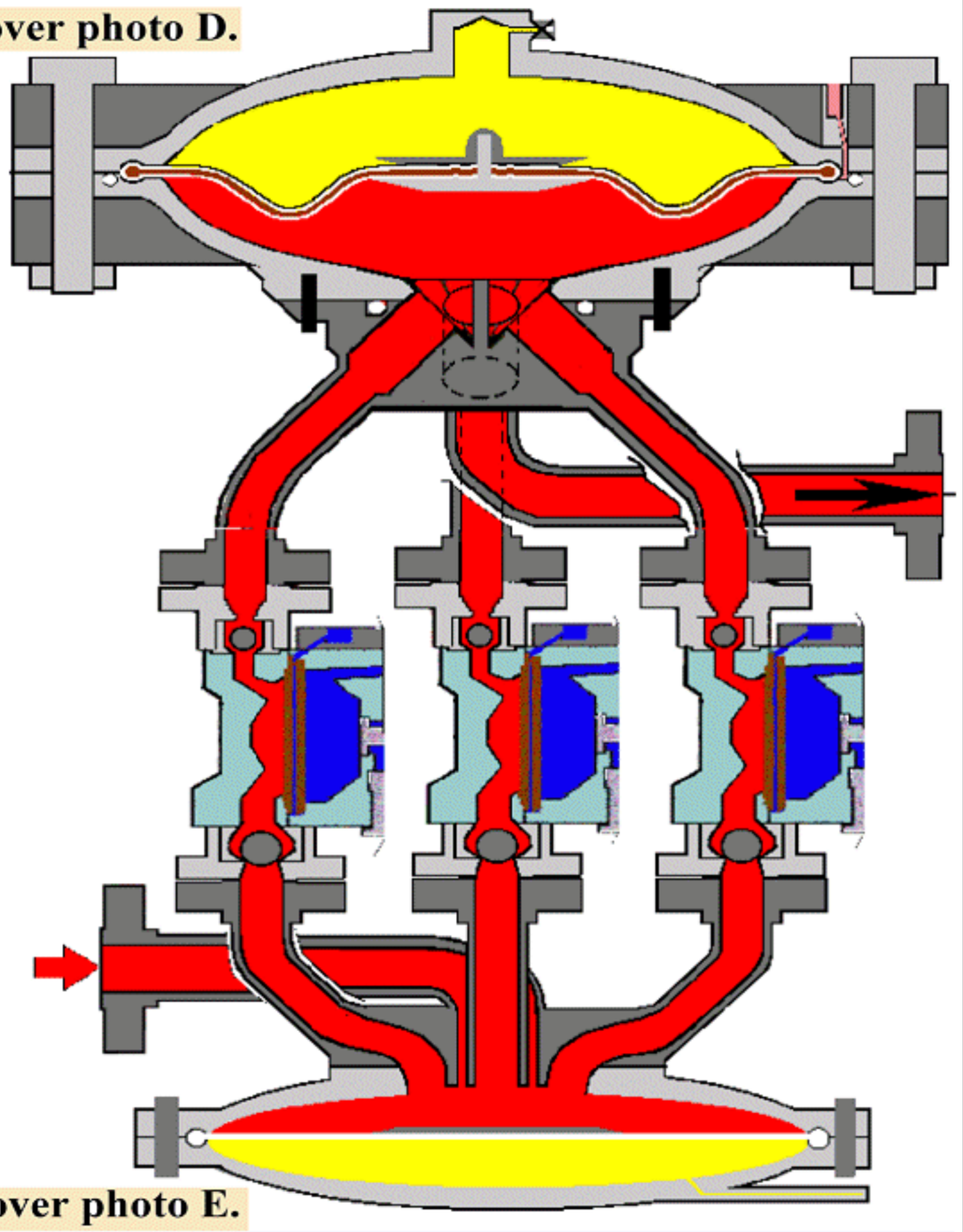
These shocks are bad for all forms of instrumentation, and usually cause pipe shake as well.

An in line through flow damper is needed to intercept the shocks.

MULTI-HEAD INTERACTION

Transients from one pump head, disturb the check valves of the next.

From the cover photo D.



Ref: "Shock" above, and "Pressure Pulsation" previously.

When volumetric efficiency is less than 93%, the level of shock and pressure pulsation become greater than can be tolerated by adjacent check valves.
Beware of hot and compressible liquid piping systems.

To prevent pressure transients in the suction line from breaking the liquid column into alternate slugs and voids, it is essential to intercept and remove the transients.

This may be achieved by placing a flow-through pressure pulsation interceptor individually in the line to each check valve, or one central damper, as shown here, with non interconnected pipes leading to a piping base block.

This prevents the check valve from one cylinder "talking" to an adjacent cylinder, causing it to open when it should close, and creating an even greater fall in efficiency.

Similarly, in the discharge system, the extreme levels of discharge shock that comes from low efficiency, not only destabilises valves that should be re-seating, but also makes control by feedback from instuments a near impossibility.

The rule is never to use a normal "manifold", they create the maximum interaction.

From the cover photo E.

Prevent the suction system piping design or "manifolds" from wrecking your pump.