Liberty

INTERSECTION DEEP-DIVE / FLUID TRANSFER

How to Select Diaphragm Pumps for Caustics/Bases Service

Caustic service doesn't follow the same "fluoropolymer is always safe" logic that acid service does — the material call is different, and the exceptions matter.

THE PROBLEM THIS GUIDE SOLVES

Caustic service breaks the default material assumption

> Most chemical-service material selection defaults to "PVDF and PTFE are broadly excellent, so start there." Caustic/base service is a documented exception to that default — and treating it like acid service is a real, sourced risk, not a theoretical one.

DIAPHRAGM PUMP FIELD DATA — POTASSIUM/SODIUM HYDROXIDE DOSING

Graco QUANTM i30 electric diaphragm pump

`Potassium Hydroxide (KOH)` `Sodium Hydroxide (NaOH)`

PP and PVDF wetted materials are confirmed in field use. 316 stainless steel is confirmed **not suitable** for this service — a LibertyCES case study at a major U.S. cheese plant (50% H_2SO_4 / 45% KOH dosing) documents this directly. The QUANTM i30 electric diaphragm architecture, which runs without a traditional mechanical seal, delivered a 24% chemical-consumption reduction on that installation through more precise dosing control — not through a stronger pump.

A separate, important caution — sourced from tank material guidance, not pump data: Peabody's Special Application Tanks documentation states that for sodium hydroxide storage, *both* Viton and PVDF should be avoided, with EPDM required instead — an unusual double-exclusion that runs counter to the "premium fluoropolymer is always the safe default" pattern seen elsewhere. This is tank-construction guidance, not diaphragm-pump wetted-parts data, and should not be assumed to transfer directly to pump elastomers or seals — but it is a real, documented case where a standard elastomer outperformed premium fluoropolymer options for this exact chemistry, and it is reason enough to verify elastomer selection for any NaOH service rather than defaulting to PVDF/PTFE by habit.

THE SPECIFICATION RULE

Don't default to the acid-service material logic

Acid service and caustic/base service are not the same material problem. Where acid service generally rewards defaulting to PVDF, PTFE, or Halar/ECTFE, caustic service has at least one well-documented case (sodium hydroxide, per Peabody's tank guidance) where those same fluoropolymers underperform a standard elastomer. The correct process for a diaphragm pump on caustic duty is to verify the exact material against the exact chemical and concentration — PP and PVDF are confirmed field-proven for KOH dosing at the concentrations in LibertyCES's own case record, but that confirmation doesn't automatically extend to every caustic chemistry or concentration.

SOURCED TO

- `cheese-plant-wastewater-ph.md (LibertyCES field case study)`
- `graco-diaphragm-pumps.md`
- `peabody-general-catalog.md (tank material guidance, cited separately above)`

Chemical compatibility depends on exact concentration, temperature, and duty cycle. Confirm current specifications with the manufacturer before final specification.

NEXT STEP

Send LibertyCES your exact caustic chemistry, concentration, and temperature — not just "caustic service" — and get a material call that's verified, not assumed.

Request a spec review

NEXT STEP

Send LibertyCES the process data, not a part number.

Exact chemical, concentration, temperature, flow, pressure, and current equipment — that's what a real spec review needs to start.

Request a spec review

sales@libertyces.com

(559) 395-5500

libertyces.com