9 inputs determine the right vacuum end-effector.

A distributor-facing pre-quote checklist. If the customer answers most of these at the first call, the second call is the quote.

01 **What's the part being picked, material, surface finish, weight, and dimensions?**

Every spec decision flows from this. **Material drives cup elastomer** (NBR for general, silicone for hot or food-contact, FKM/fluorosilicone for oily). **Surface finish drives cup geometry** (flat for rigid, bellows for curved or compliant). **Weight drives total cup area required.** Get a photo and a part spec sheet before quoting.

02 **Is the part surface flat-rigid, curved, porous, or textured/oily?**

The four surface conditions each have a different cup answer. **Wrong cup geometry is the #1 failure mode**: a flat cup on a curved part dumps vacuum past the unsealed edge. Photograph the part contact surface; don't trust verbal descriptions of geometry.

03 **What's the cycle rate, picks per minute?**

Under 30 picks/min, a single-stage ejector with no release valve is fine. **Above 60 picks/min you want a multi-stage ejector with a vacuum-release valve** to detach the part fast and reset for the next cycle. Continuous workholding mode runs different ejector spec than high-speed pick.

04 **Is there electrical service at the end-effector, or is this air-only?**

Ejector-based vacuum is the answer when there's no electrical at the end-effector: the venturi runs on shop air, no power, no pump. **If there's electrical and the cycle is continuous vacuum, evaluate a centralized electric pump** against the ejector air-cost over the install life.

05 **How will the PLC know the part is actually held before the arm moves?**

Vacuum sensor on the line. **SMC ZSE switched output** to a PLC discrete input is the standard pattern. Skip this step and the robot will eventually drop parts it never actually picked up: the cost of that incident dwarfs the $100 sensor cut every time.

06 **What's the hold time, instant grab and release, or sustained holding?**

Instant grab → cycle the vacuum on demand, ejector runs only during pick. **Sustained holding** (workholding, mill down-force) → ejector runs continuously and air cost compounds; evaluate centralized vacuum-pump alternative on continuous-duty jobs.

07 **Is the part going through hot, cold, washdown, or chemically aggressive process?**

Process environment dictates cup material. **Hot forming → silicone or fluorosilicone**; food contact → FDA-grade silicone; oily machine shop → FKM; cold storage → silicone (NBR stiffens cold). Match the elastomer to the worst-case condition the cup will see in the cycle.

08 **How many cups per station, and how many stations on the line?**

Multi-cup picks share the same vacuum source but each cup gets its own check valve so a missed pick on one cup doesn't dump vacuum on the others. **Cup count drives ejector flow sizing** and replacement-cup stocking levels. Multi-station lines need a working spare bank, not a single replacement.

09

What's the holding force the part actually requires, weight × safety factor × dynamic loads?

Total holding force = part weight × 4 (typical safety factor) + any acceleration / deceleration load the robot imposes on the pick. Customers consistently undersize cup area by counting static weight only. Fast-acceleration picks need more cup area than slow-move picks of the same part.