



VALVE DESIGN CHECKLIST

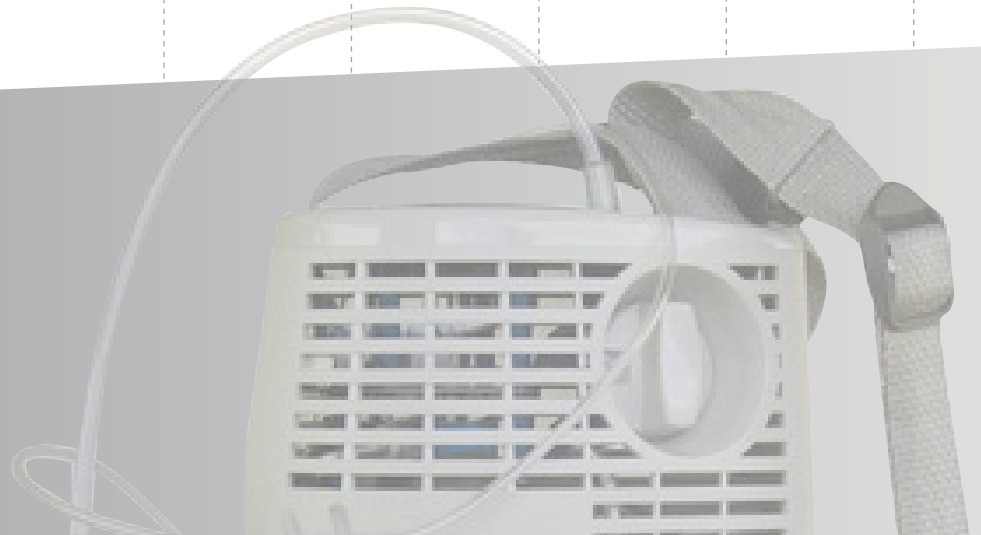
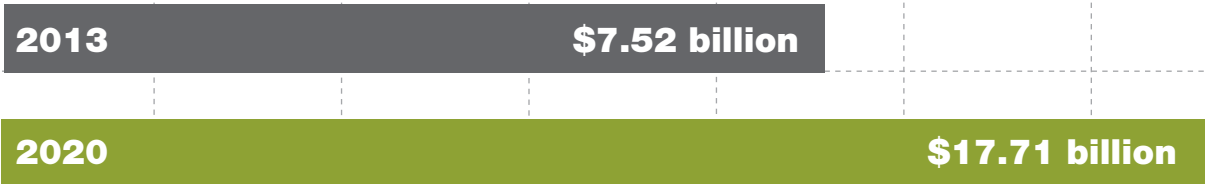
6 Factors for Mobile/Portable Products

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Today's product design challenge: get things moving.

When considering the manufacturing industry, consumer products, or the medical field, one factor holds true: demand is surging for durable, portable products that can handle the frantic pace of a modern workday.

Global market size for portable medical devices



Valve design choices lay at the heart of many product development challenges.

Looking to overcome the portable design challenge?

Consider these 6 valve design factors.

- Power Consumption
- Size
- Weight
- Performance
- Durability
- Ability to Customize

POWER CONSUMPTION

Batteries are often among the largest, heaviest components in a portable product. Optimizing valves for minimal power consumption is a vital step in portable product design.

Pipe size, flow factor, pressure differential, and maximum temperature influence power requirements. **Every application is different.** There is no “right valve” for every portable product.

BALANCED VS UNBALANCED VALVE DESIGNS:

Balanced valves offer relatively greater performance and flow capacities at lower power consumptions. Unbalanced valves are lower in cost, and rely on the forces of the solenoid magnetic field and/or the return spring to overcome forces generated by the supplied media pressure.

Another option: the **latching solenoid** valve design. 50 millisecond pulses of current to the coil cause the valve to switch between positions. The valve is **unpowered during hold time**, delivering significant long-term energy savings in some applications.



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SIZE

Determining minimum flow capacity at a minimum pressure sets a minimum for valve size. However, careful consideration of alternate operating pressures and/or increased power consumption can open up the possibility of smaller valves that save significant space.

Today, spool type valves achieve the highest flows from relatively narrow profiles. Designers must plan for tradeoffs, such as greater leak tendencies over time, from sliding elastomer wear. These tradeoffs lead many designers to choose from a range of increasingly compact poppet valves.



WEIGHT

Valves are rarely among the heavier components in portable products, but when designing for today's competitive marketplace, every ounce saved can help.

Choosing the right valve materials is critical. Injection-molded plastic stacks up well against many metals, but may not be appropriate for high-temperature applications. Aluminum is a viable alternative and an anodized finish improves its durability and compatibility with many media.

MATERIAL

Brass

Steels

Aluminum

Injection-molded plastics

SPECIFIC GRAVITY

8.4 – 8.7

7.7 – 7.8

2.5 – 2.8

0.9 – 1.7



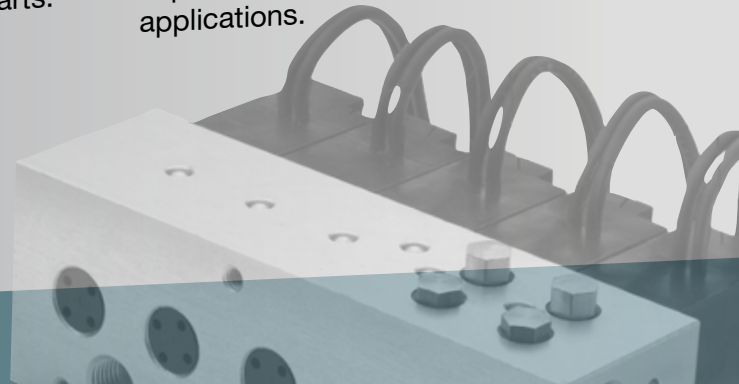
4 PERFORMANCE

Of course, size and weight advantages are irrelevant if the valve cannot meet system performance requirements. While flow capacity is the primary consideration, other performance factors must also be thought through.

Response time: Minimizing the milliseconds of elapsed time between electrical signal and valve opening/closing can be critical in medical and safety applications, particularly when controlling the amount of media delivered downstream with each cycle. As a rule, poppet-type valves fully open milliseconds faster than their spool-type valve counterparts.

Leakage: While leakage is undesirable in almost all situations, the severity of designed-in leakage and potential leakage over valve life varies from application to application.

Precision: The ability to precisely control and repeat flow rate (cycle to cycle) is becoming especially important in portable medical applications.



DURABILITY

Compared to their stationary counterparts, portable devices take a beating. Choosing a robust, long-lasting valve is always important—in portable applications it becomes essential.

Choosing a reliable valve requires careful analysis of the application. **CONSIDER THESE VALVE DURABILITY FACTORS:**

Moving parts, sliding surfaces, and metal-to-metal wear: The less, the better. Wear caused by friction leads to a form of valve failure and can potentially compromise the purity of the transported media.

Materials: In selecting durable materials, designers must consider ambient temperature, valve coil heat rise, corrosion by fluid media, and compatibility with ambient environment.

Quality of Pressurized Media: All portable devices include either a small onboard compressor or pressurized supply reservoir. Each source presents unique compatibility challenges to valve life, resolved primarily with elastomer selection. As a rule, poppet-type valves are more immune to poor or difficult media.



ABILITY TO CUSTOMIZE

One consistent factor:

**EVERY APPLICATION
IS DIFFERENT.**

The unique needs and challenges of each portable equipment application will usually require some form of system optimization. When off-the-shelf valves cannot satisfy the project's needs, customization can help. Features such as custom manifolds, valve bodies, valve stroke flexibility and mounting configurations can often prove vital in overcoming design hurdles.



The challenge in design is not only balancing trade-offs to select the perfect valve, but doing so on-time and on-budget. That's where partnership is vital.

Humphrey is your worldwide partner for valve design and production. Our experienced staff of over 250 employees is ready to help you tackle your biggest design challenges. If you're looking to significantly reduce your product development cycle and create vital cost efficiencies while freeing your team to focus on core competencies, contact us at **1-800-477-8707** or visit us online at **<http://www.humphrey-products.com>**.

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