How New Lead-Free Regulations Will Impact Your Selection Of Potable Water Valves

by Paola Gutierrez

A White Paper From ASCO Valve, Inc.

❶ Getting the lead out

Recent legislation in several states has tightened regulation of lead content in the components of potable (drinkable) water treatment systems. Other states may well be considering similar moves. This pace of regulation seems unlikely to slacken.

The message from regulators is clear: Get the lead out. However, what options are open to construction end users and original equipment manufacturers (OEMs) of these systems? Construction managers don't make the equipment they install. And OEMs often assemble most of their systems from already manufactured components. Of compliant components they can specify, which currently meet their requirements for price, reliability, and performance?

This report examines the choices facing specifiers and purchasers of small solenoid valves for potable water systems. It weighs the advantage and disadvantages of brass, plastic, and stainless steel designs. Finally, it suggests the solutions that smart planners should consider for current and future use.

❷ The legislation

In recent years, regulators have placed more restrictive lead content regulations on equipment used in water-handling applications — particularly those involving potable water.

The latest examples are California's Health & Safety Code Section 116875 (commonly known as AB1953) and Vermont Act 193. (Maryland is currently considering similar legislation, but has not passed any new regulation to date.) Basically, these regulations contain similar mandates. For instance, the California language regulates the lead content of pipes or plumbing fixtures introduced into "commerce." It reads in part: "No person shall use any pipe, pipe or plumbing fitting or fixture, solder, or flux that is not lead free in the installation or repair of any public water system or any plumbing in a facility providing water for human consumption, except when necessary for the repair of leaded joints of cast iron pipes."

The legislation also acts to “revise the term ‘lead free,’ for purposes of manufacturing, industrial processing, and conveying or dispensing water for human consumption, to refer not to the lead content of pipes and pipe fittings, plumbing fittings, and fixtures but to a weighted average lead content of the wetted surface area of the pipes, fittings, and fixtures of not more than 0.25%, to be determined pursuant to a prescribed formula.” So for each piece of equipment, inspectors will measure the surface area that comes into contact with the water (wetted surface area). This measurement will be used in calculating the component’s lead content.

The California act required compliance starting January 1, 2010.

3 The impact

Equipment manufacturers and end users have yet to determine the comprehensive impact of this new wave of regulation on their businesses. But several aspects seem clear:

Local regulators may favor broad interpretations.

Planners must assume that regulators on the spot may not share their reading of a given rule. For example, the above regulations don’t specifically mention “valve manufacturers” or makers of check valves. But experience so far suggests that local enforcement authorities might consider valves and related devices to be covered. In fact, they may well go further.

For instance, as the new rules went into effect, one construction company was erecting a medical building in California.

Construction managers read the regulation as requiring that lead-free components were necessary only for surfaces that actually contacted potable water. But building inspectors called for lead-free status of *all* the facility’s water systems. Specifically, they insisted that all valves used in water handling be compliant with the new standard — whether a given valve was directly involved with the potable water supply or not. Reason: the site’s intended use to house medical services.

This kind of broad interpretation by local authorities argues for purchasers to specify compliant models for most or all of the valves they intend for water handling.

Note: certain parts of the legislation, though, seem safe from overbroad readings. Regulations clearly “grandfather” the use of noncompliant materials in existing installations. So compliance is required only for new installations, or for older sites retrofitted with new equipment.

Numerous water handling applications are affected.

Engineers for OEMs and end users should take the new regulations into account when specifying and purchasing valves for almost any kind of water conditioning and water purification equipment, in a wide variety of applications.

Typical subminiature solenoid valve applications include:

- Reverse osmosis (RO) systems
- Misters/produce irrigation systems in supermarkets
- Coffee machines
- Frozen beverage dispensing equipment

In a typical RO setup, for example, an inlet valve takes in water; a series of membranes provides processing and treatment; one outlet valve handles permeate (clean) water while another expels concentrate water (wastewater). Previous regulations were only concerned about the lead content of the permeate outlet valve. However, the interpretation of the new rules clearly requires standardization on stainless steel or plastic construction for all valves in the RO system.

Meeting ANSI/NSF 61, Annex G, provides compliance.

One easy signpost points to materials of construction that would be judged fully compliant. For manufacturers of water conditioning and water purification equipment, these regulations (California AB1953, Vermont Act 193, and similar acts) can be met by ensuring compliance to NSF/ANSI Standard 61, Annex G.

Based on work done by the standards laboratory organization NSF International, facilitated by the American National Standards Institute, this standard establishes minimum health effect requirements for chemical contaminants and impurities that are introduced into drinking water from products, components, and materials that are used in potable water systems.

NSF/ANSI Standard 61, Annex G, includes strict technical requirements regarding contaminants (i.e., lead) that leach or migrate from the product/material into the drinking water at above acceptable levels.

Like California AB1953 and Vermont Act 193, Annex G limits equipment lead content to a 0.25% maximum of the wetted surfaces on a weighted average basis.

OEMs and end users interested in whether a given valve exhibits full compliance under the new regulations can simply check the NSF Web site at www.nsf.org and follow the link for Low Lead Plumbing Products Guide.

To simplify compliance, NSF has announced a new standard proposed for adoption by the end of 2010. NSF 372 — Drinking Water System Components — Lead Content would represent a new home for the evaluation procedures (weighted average lead content calculations, etc.) currently housed in NSF/ANSI Standard 61, Annex G.

Reasons for the change: NSF/ANSI 61 may not align perfectly with all product types covered under new laws such as the California and Vermont legislation; the new standard could do so. Also, some jurisdictions might want to mandate compliance with Section G's lead content requirements, but not with other areas of NSF/ANSI 61. So they would now be able to require compliance with NSF 372 or NSF/ANSI 61 separately.

If and when the language passes in its proposed form, manufacturers could consult either standard for 3 years after adoption, at which time Section G would be retired and NSF 372 would continue.

Compliance requirements affect an increasing number of states.

OEMs who sell nationally may find it more trouble than it's worth to segregate segments of their sourcing, manufacturing, and distribution operations solely for products shipping to California or Vermont. Remember, they might soon have to add Maryland — or any of the growing number of other states that may enact similar compliance regulations in the near- or medium-term.

End users may be similarly concerned. Are they planning potable water systems for construction sites in states currently lacking stricter regulations? If so, they must keep in mind that constraints may tighten before construction is completed.

4 The material choices

When purchasing valves for just about any water system, then, the sensible course for most OEMs and many end users would seem to be buying valves that already comply with the strict new regulations.

This component selection must be heavily influenced by the range of allowable materials. At this point, valve buyers are presented with three options: brass, plastic, or stainless steel.

Brass

Traditionally, the preferred choice for water system valves has been brass. It's the material of construction used in the vast majority of such valves currently installed.

However, this choice is problematical under the new regulations. Brass is an alloy of copper and zinc. But it almost always contains at least a small amount of other metals — usually including lead, added to permit easy machining.

Commonly used brasses, such as brass alloy per ASTM B283, UNS C37700, have a lead content ranging from 1.5% to 2.5%. This amount of lead content makes it unsuitable for use in a lead-free valve application.

Some OEMs have noticed that the regulations don't mandate totally lead-free components: just a weighted average lead content of wetted surfaces (as a percentage of the overall system). So it might be theoretically possible to use a brass valve if, for instance, all other wetted components in the system were made of nonleaded materials such as stainless steel. However, the combination of variable sourcing, the potential for last-minute design changes, and the calculation of weighted average lead content for every assembly make this solution too troublesome for most manufacturers.

Another possibility: some suppliers now offer lead-free brass — a specially formulated alloy whose lead content is small enough to fall below the mandated limit of 0.25%. However, this brass has so far been used only in simply machined fixtures and fittings such as pipes and elbow joints. To date, no brass valve on the market meets the new regulatory restrictions.

Valve manufacturers may attempt to develop such lead-free brass valves in the future. However, machinability could be a problem. A manufacturer who continued to make regular brass components for other uses would have to maintain dedicated machines for the special lead-free components, or risk cross-contamination from leaded components run on the same process. Recycling such components could also present difficulties.

Finally, at current pricing, lead-free brass valves would be at least three or four times more expensive than regular brass models, becoming one of the most expensive choices available. It seems unlikely that OEMs and users would favor this choice in any significant degree.

Plastic

Plastic solenoid valves can be a "lead-free" alternative to traditional brass models.

Some companies now provide plastic solenoid valves that meet NSF/ANSI Standard 61, Annex G (or the proposed NSF 372), thus complying with the strictest of the new regulations. OEMs that choose valves made of plastic need not undertake the wetted average surface calculations necessary with brass valves.

However, users and especially OEMs report a number of concerns with current plastic solenoid valves' quality, performance, and availability.

Valves may be received with voids (holes) in the body due to imperfect injection molding. Testing may reveal problems such as leakage through badly formed valve bonnets. Additionally, usage may prove unreliable, even in nonextreme applications. Users report

that actual performance may fall below rated flow and temperature specifications. Finally, many of these valves are manufactured outside of the United States, and lack of readily available new models or replacements has proved a recurring concern.

Users and OEMs should stay alert to forthcoming developments in this area. Leading manufacturers are engineering a new generation of valves with composite or thermoplastic materials, strict quality processes, and improved designs that may eventually make plastic the water valve material of choice.

Stainless steel

Stainless steel represents the most costly material choice for constructing the solenoid valve types covered in this report.

However, it's also emerging as the safest option.

Stainless steel valves from reputable manufacturers are already well-tested as proven performers in potable water systems. Buyers can be assured that, unlike today's plastic models, they will be readily available, arrive free of quality defects, and perform to specifications.

Use of stainless steel valves will also avoid the tedious and sometimes problematical calculations of weighted average lead content necessary with brass models.

Most importantly, these valves should easily comply with the newest lead content regulations in any state. In fact, ASCO was the first to market with two stainless steel subminiature solenoid valve models that are certified to NSF/ANSI Standard 61, Annex G (and thus would also meet the proposed NSF 372), and are now in compliance with California's Health and Safety Code Section 116875 (commonly known as AB1953) and Vermont Act 193.

With less than 0.25% lead content, these valves are also the safest for the final consumers of potable water systems. After all, safer water is the ultimate goal of all the new regulations.

5 Conclusion

As populations grow and competition for scarce water resources increases, potable water systems receive more and more attention. Some of this attention comes from regulators. Thus, lead content restrictions are likely to increase in severity in coming years, becoming widespread on the national and international scenes. Specifying engineers and purchasers of solenoid valves for potable water treatment equipment must remain aware of these trends.

Recent legislative developments suggest that use of brass valves has become problematic. Lead-free brass valves are not yet marketed, and may not become available to any useful degree. Existing plastic valves may suffer from problems of availability, quality, and performance, although the next generation of composite, engineered plastic models holds promise of solving some or all of these challenges.

Stainless steel valves from reputable makers represent the single currently practical choice for OEMs and users who seek ready availability, ensured reliability, proven performance, and tested compliance.

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