# Understanding the Difference between Diaphragm and Piston Flushometers

SLOAN®

# Presenters

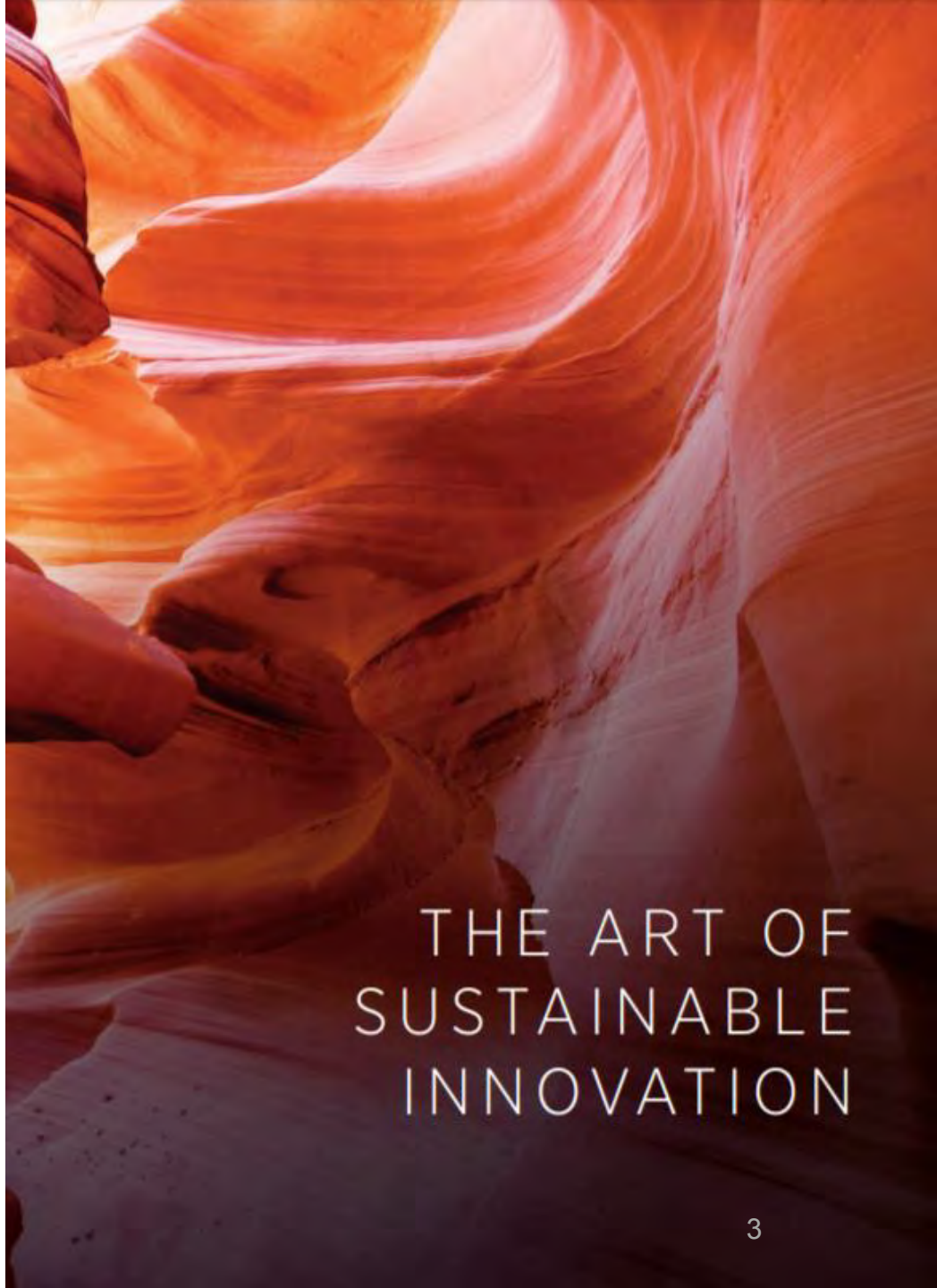
**Rolando Zambrano**
Associate Product Line Manager
Sloan Valve Company
Franklin Park, IL

**Don Yurkovich**
Regional Sales Manager
Sloan Valve Company
Franklin Park, IL

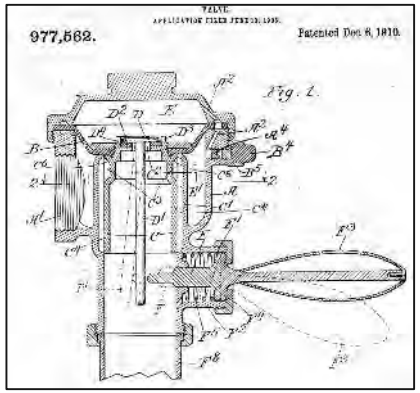
# Agenda

This presentation will cover:

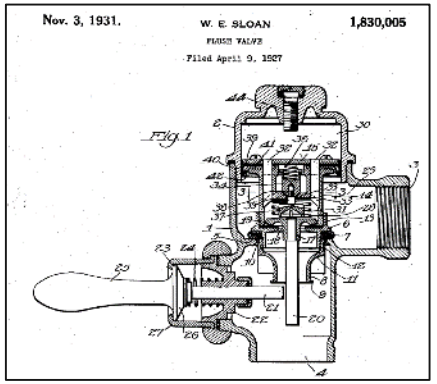
- Origins of piston and diaphragm technology
- Fundamental operating principles
- Features and benefits of each flushing method
- Selection criteria
- Summary



# History








**1906**
**Sloan invents the Diaphragm Flushometer**

- Replaced overhead tanks
- Relied on water pressure, not gravity
- Used less water and energy

**1928**
**Sloan invents the Piston Flushometer**

- Withstood hard water*
- Better under low pressure
- Tolerated debris*

*not piston advantages today

# Which Sloan products are Diaphragm or Piston?

Diaphragm

Regal

Sloan

Royal

Piston

Gem

Crown

# Which Sloan Products are Piston or Diaphragm?

## Diaphragm

Regal

Sloan

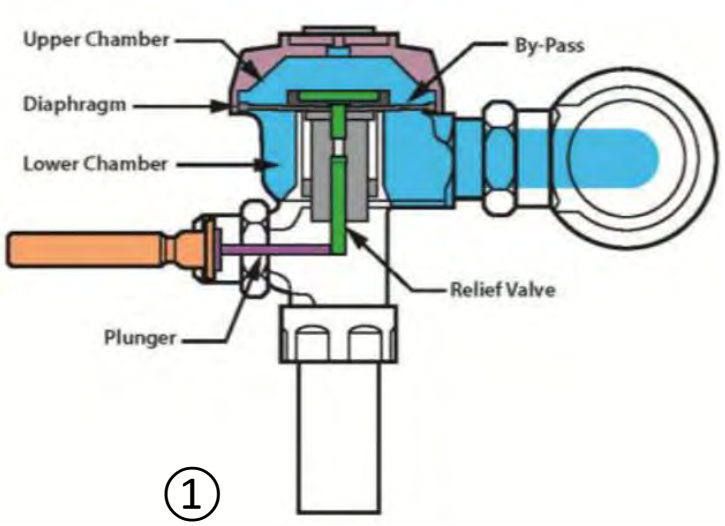
Royal

## Piston

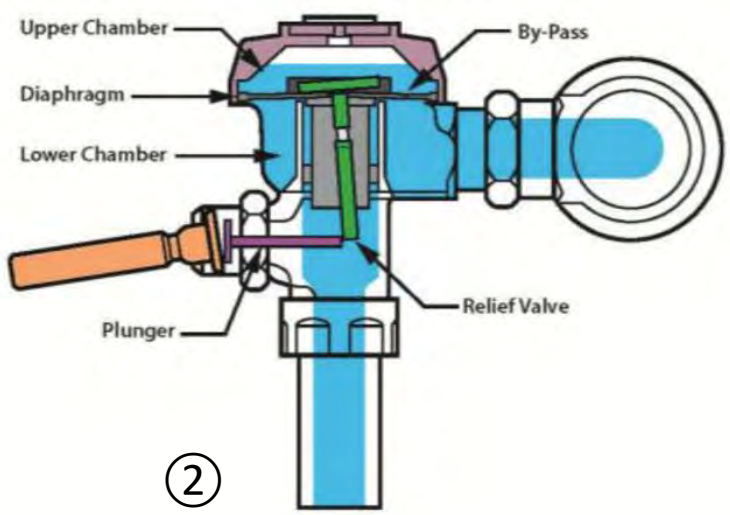
Gem

Crown

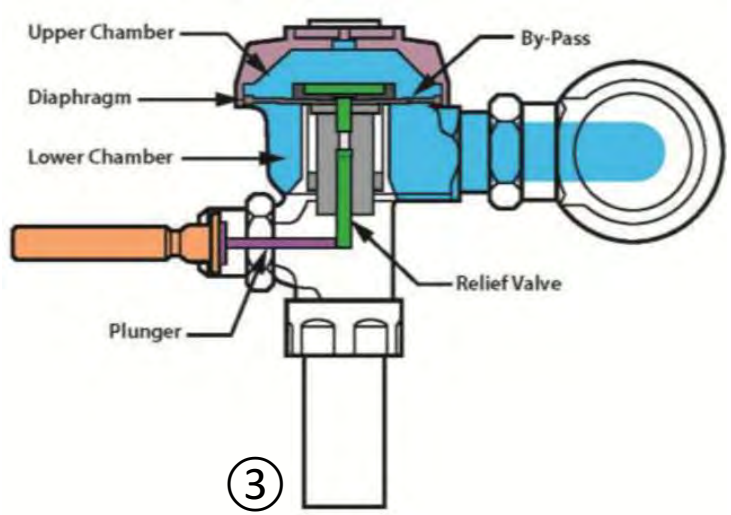
# How A Diaphragm Works




Incoming pressure to the upper chamber seals the diaphragm down over the lower chamber



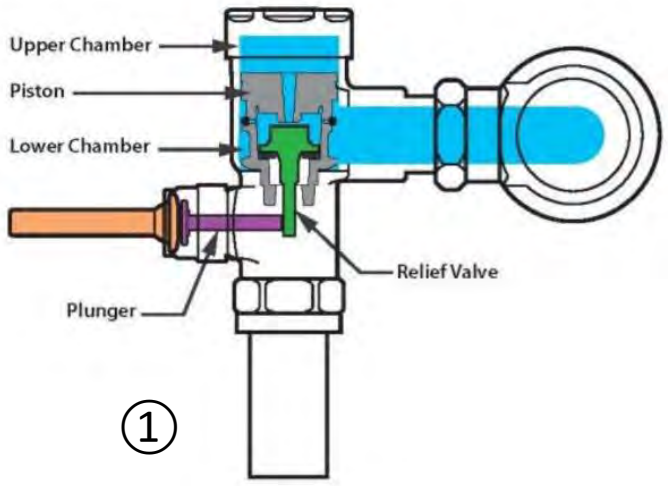

Moving the handle causes the diaphragm to flex, releasing water into the fixture



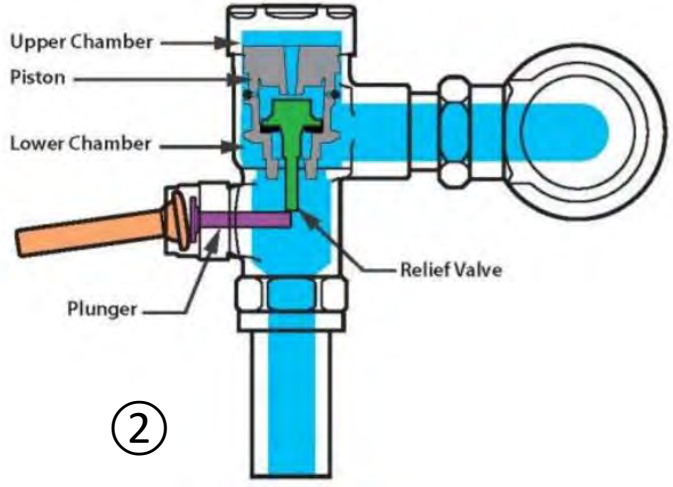

The diaphragm re-seals as the upper chamber re-pressurizes

All Sloan diaphragm flushometers are “non-hold open” design

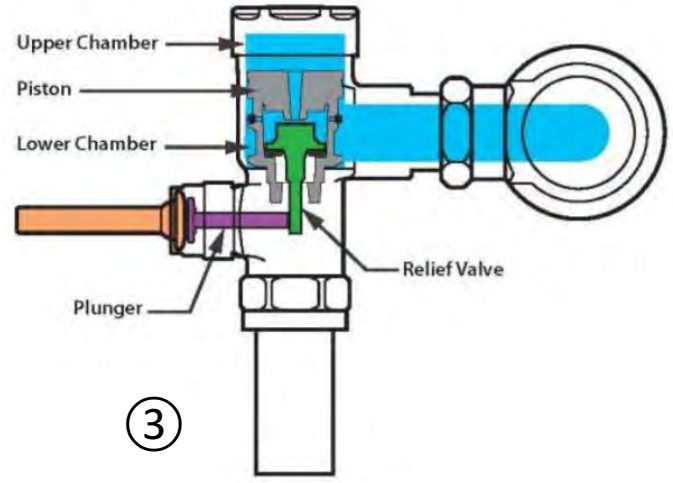
# How A Piston Works




**Incoming pressure to the upper chamber seals the piston down over the main seat**




**Moving the handle causes the piston to slide up, releasing water into the fixture**




**The piston re-seats as the upper chamber re-pressurizes**

Sloan Piston Valves are also “non-hold open” design

# Is Performance Different?

Both do the **SAME** thing:

- Control the flow rate and volume of water
- Reset quickly for the next flush

They have **DIFFERENT** internal sealing methods:

- Diaphragm – Static (flexing) seal
- Piston – Dynamic (sliding) lip seal

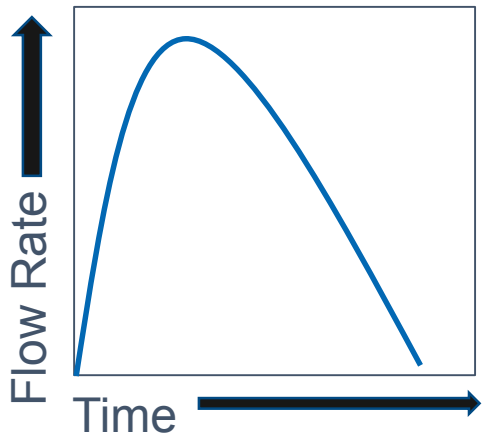
**FLEX**

**SLIDE**

Different sealing methods create different flush curves

# Why do Flush Curves Matter?

## Diaphragm

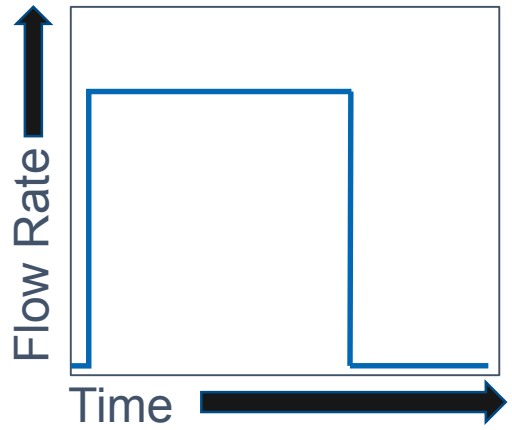



The flexing action provides a smooth open and close cycle.

Having a gradually decreasing flow at higher pressures prevents a “hard close.”

A slower close of the flush cycle helps prevent noise.

## Piston




The slide action delivers most of the water to the fixture at the beginning of the flush cycle.

A quick in-rush of water into a old style washdown fixture at less than 25 PSI could help to clear the bowl.

# Variables That Can Impact Selection

**Water Supply**
- Flow
- Pressure
- Properly sized (strong)
- Under sized (weak)

**Water Quality**
- Chlorine/Chloramines
- pH
- Sediment

**Fixture Type**
- High efficiency (HE)
- Closet
- Urinal

**Usage Pattern**
- Frequency
- Volume

# Design Element Summary

| Basic Design | PISTON | DIAPHRAGM | Why It Matters |
|---|---|---|---|
| Valve Body Construction | Semi red brass | Semi red brass | Better corrosion resistance than yellow brass |
| Valve Mechanism | Non-hold open | Non-hold open | Prevents water waste and vandalism |
| Sealing Mechanism | Dynamic | Static ✓ | Diaphragm seal wears less |
| Stroke Length | Long ✓ | Short | Longer piston stroke less sensitive to system change |
| Sealing Surfaces | 3 | 2✓ | 50% more seals |

Sloan piston and diaphragm valves have the same rough-in height

# Operating Performance Summary

| Condition | PISTON | DIAPHRAGM | Why It's Better |
|---|---|---|---|
| Low Pressure | Better ✓ | Good | Performance below 25 PSI |
| High Pressure | Good | Better ✓ | Slower shut off at higher pressure, less noise |
| Under Sized (Weak) System | Better ✓ | Good | Dynamic pressure performance |
| Fixture Back Pressure | Good | Better ✓ | Adapts to fluctuations |
| High Chloramines | Good | Better ✓ | Synthetic diaphragms last longer |
| Sediment | Poor | Better ✓ | Less wear and rubbing |
| Manual to Sensor Retrofit Options | Less | More ✓ | Many more options |

# Perception vs. Reality

***"Piston valves work better with low pressure and gritty water."***

- May have been true from 1928 to 1997* when high efficiency fixtures were introduced
- Modern fixtures require at least 25 PSI to function properly
- Older, less efficient wash down fixtures with low pressure might use pistons
- Diaphragms last longer than pistons in gritty water because they don't slide and wear

* Enforcement of Energy Policy Act of 1992 began January 1st, 1997 mandating 1.6 GPF max. for water closets and 1.0 GPF max. for urinals sold in the USA.

This is no longer a true statement

# Perception vs. Reality

## Other misconceptions…

*“Piston Valves never need repair”*

- All valves will eventually need repair

*“When piston valves fail, they fail in the closed position”*

- Both Pistons and Diaphragms can fail in the open position for the same reasons – wear, abrasion and clogged bypasses

# Summary

- Sloan invented both diaphragm and piston valves. Both technologies have strengths
- Water quality, system dynamics, and restroom traffic will impact which is selected
- Modern fixtures require 25 PSI or more and tend to benefit from diaphragm technology
- In low pressure (<25 PSI), under sized (weak), and older fashioned systems pistons have an important role to play

# Join Our Next Webinar – Thurs, May 21: Regal vs. Sloan vs. Royal Flushometers

Diaphragm

**Good**

Regal

**Better**

Sloan

**Best**

Royal

Register to attend here!

# Upcoming Sloan Training Webinars

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Sloan Sensor Faucet Recommendations for Return-to-Work and Facility Start-Up


May 7th

Battery Truths and Myths


May 14th

Touch-Free Hygiene in K-12 and Higher Education Facilities

May 21st

Regal vs Sloan vs Royal


May 28th

PWT New Product Launch

# Questions?

# Training Comments, Questions, or Suggestions?

Andrew Warnes
Manager – Technical Training
Sloan Valve Company
10500 Seymour Avenue
Franklin Park, IL USA 60131-1259

Office: +1-800-982-5839
E-mail: training@sloan.com
Web: sloan.com