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Technology for Smart Restrooms

Perspectives from a Plumbing Manufacturer

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Technological Innovation

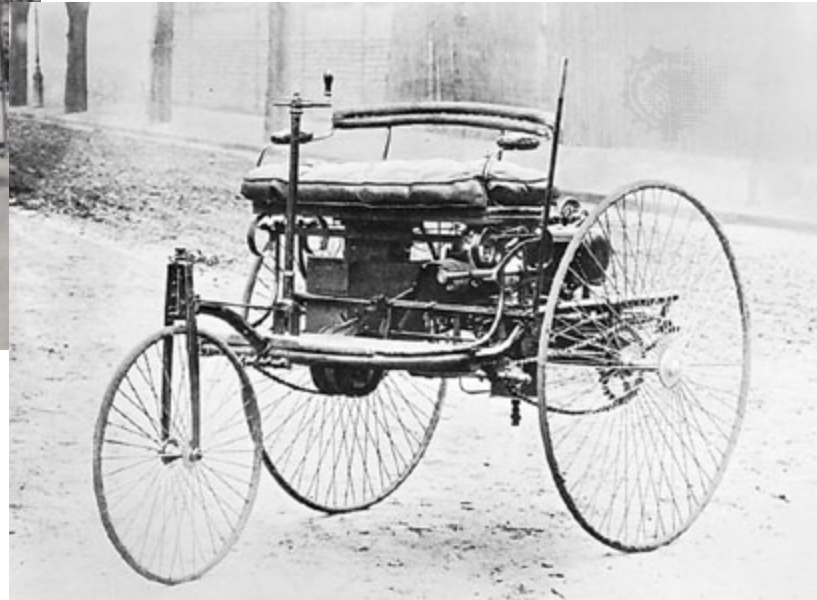


We can chart innovations over time
in many different industries.

Early Autos



A rope-tired car from 1899



The first Benz was first driven in public in Mannheim, Germany, on July 3, 1886, where it reached the “blazing” top speed of 9 miles (15 km) per hour.

Early Cell Phones



On April 3, 1973, the first cell phone featuring a brick-like design debuted. The model weighed a hefty 30 ounces. The “shoe phone” first came onto the market in 1984 costing nearly \$4,000 with half an hour of talk time.

Early Plumbing

- 1596: The first toilet is invented
- 1815: The pottery toilet is invented
- 1883: The first one-piece ceramic pedestal toilet is invented



Early Plumbing

The outhouse is one of the first “waterfree” toilets—and you can enjoy it in the Great Outdoors!



Early Plumbing

Still “waterfree,” but it’s moved indoors.

U.S. President Thomas Jefferson’s home, the first American home with indoor plumbing.



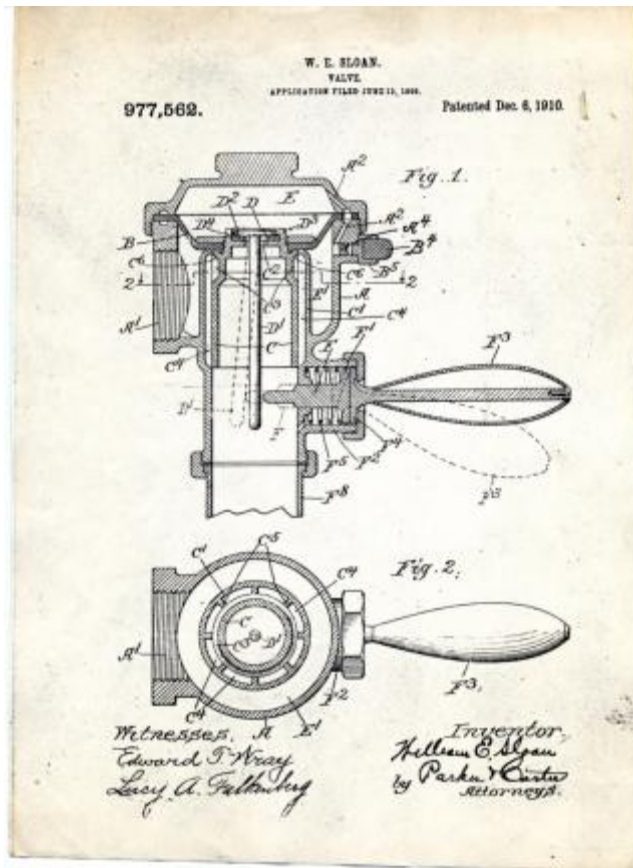
Early Plumbing



Early 20th Century: the pedestal vitreous china plumbing fixture evolves.

By the 20th Century, the china urinal is introduced, which soon leads to the introduction of wall-mounted lavatories, urinals and water closets.

Plumbing Advancements



Patent drawing from 1906

Invention of Flush Valve in 1906

- Regulates water use
- Better performance with less cycle time



Plumbing Advancements



Tank Toilets

- Gravity
- Pressure-Assist

Plumbing Advancements



Introduction of Sensor Technologies

- Automatic, hands-free operation for toilets, urinals and faucets
- Promote hygiene, convenience, water savings
- Power options: hardwired, battery, solar, turbine

Water Efficiency in Today's Restrooms

Conservation Measures Driven By:

- Government regulations, codes
- Water districts
- Green building movement
- Environmental groups
- Building owners/independent stakeholders



Water-Efficiency Developments



Plumbing Focuses on Using Less Water More Efficiently

- **Dual-Flush Flush Valves:** 1.6 gpf (6.0 Lpf) for solid waste and 1.1 gpf (4.2 Lpf) for liquid waste
- **Fractional Flush Urinals:** use as little as a pint of water
- **Waterfree Urinals**
- **Faucets** using 0.5 gpm or less

Water-Efficiency Developments

Rainwater Harvesting:
collect, store and supply
water for flushing, irrigation

Graywater: reuse water
from sinks (typically) to use
for flushing, other needs



What If...



...restrooms were adaptable based on traffic?

What If...

...restrooms could automatically alert management to trouble conditions, such as an overflowing sink or toilet run-on?



What If...



...facilities received electronic warnings of leaky or burst pipes behind the wall before they caused damage and wasted water?

Tomorrow's Restroom is Here Today



Chicago's Museum of Science & Industry:

- Opened in 1933: This public museum showcases mankind's greatest advancements through time.
- Today: Its restrooms carry that same spirit of technological advancement.

Chicago's Museum of Science and Industry



The museum also installed a revolutionary system: a networked, automated system that monitors and can remotely control all toilets, urinals and faucets in the restrooms. The system can track usage for each fixture.

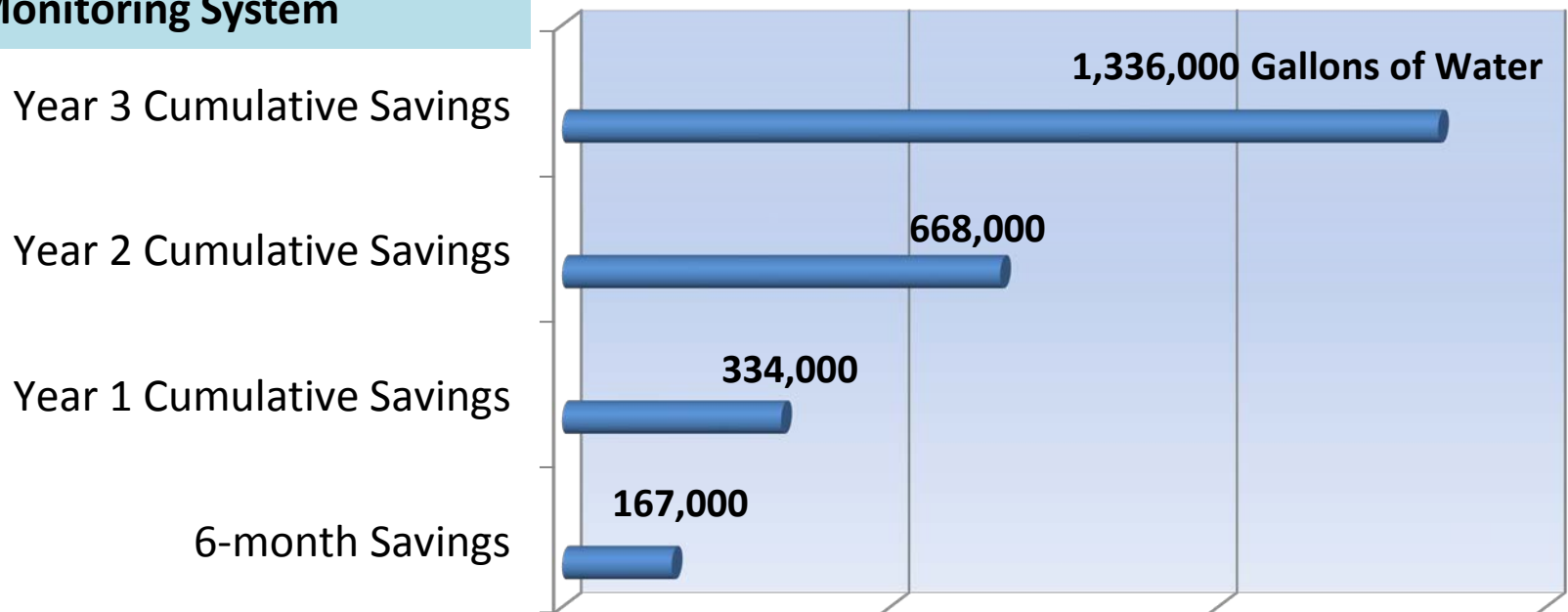
Chicago's Museum of Science and Industry



A dashboard view lets facilities personnel remotely view restroom conditions and run analyses, including how much water has been used by each, individual fixture or entire restrooms. Personnel is notified when a toilet malfunctions or a sink overflows, and fixtures can be remotely turned off if necessary.

Chicago's Museum of Science and Industry

**Estimated Water Savings
(in gallons) with water
saving fixtures & Restroom
Monitoring System**



Restroom Monitoring System



The system can communicate to PCs or remotely to smart phones, tablets and other devices to:

- Issue job tickets for custodians/housekeeping
- Send emergency alerts to plumbing staff
- Inform management of “big picture” issues

Restroom Monitoring Systems



Old School:

Sort through mountains of paper to understand what's going on

New School:

Intelligence is literally at your fingertips—instantly and wherever you go

Restroom Monitoring Systems

The automated system:

- Generates data for building commissioning
- Could help with LEED® reporting
- Helpful for long-range planning for better restroom usage/greater water savings
- Capable of integrating with other building automation systems