This presentation premiered at WaterSmart Innovations

watersmartinnovations.com
Auto-Diverting Tub Spouts & Applegate Apartments WaterSmart Innovations 2019
Brief Technology Explanation - How A TSV Works

COLD EXITS

STOPS WHEN HOT

NORMAL FLOW SHOWER

Behavioral Waste

Structural Waste

Showering

90 F

100 F

110 F

120 F

80 F

70 F

60 F

50 F

0:00

0:45

1:30

2:15

3:00

5:00

3:00

1:30

2:15

3:00
Shower Structure – Key Considerations For Water & Energy Use

**Structural**
- Water Heater
- Plumbing Lines
- Mixing Valve
- Shower Head

**Behavioral**
- Bather

**Behavioral Opportunity For Change**

**Structural Can’t Really Change**

**Distance, Volume & Velocity**

**Flow Regulation**

**Mix Ratios**
20% - 30% Of Shower Is Wasted Before Bathing Begins

In 2004 and 2011 papers Jim Lutz at Lawrence Berkeley National Lab indicate that shower warm-up waste falls in the 20% - 30% range.
Behavioral Waste Estimates From Field Research

Based on primary and secondary research from LBNL as well as 3rd party pilot studies Behavioral Waste is approximately 1 minute per shower taken.

- 2004: Secondary Research via REUWS
- 2011: Small Pilot Study
- 2013: Evolve Analysis of Field Data
  - n = 18 bathrooms / 283 events
  - 39-59 Seconds

- 2014: Multifamily Pilot Study
  - n = 240 apartments (120 control)
  - ~ 60 Seconds

- 2015: Pilot Study
  - n = 22 bathrooms / 581 events
  - 59 Seconds
**Core Product Lines**

**ShowerStart® TSV**
- Eliminates behavioral waste
- Universal compatibility
- Solid brass construction
- Easy installation

**Showerhead**
- Eliminates behavioral waste
- Pressure compensating performance
- Multiple spray patterns and flow rates
- Exceeds WaterSense standard

**Standard Showerheads Also Available**

**Single & Multifunction Showerheads**
- Multiple spray patterns and flow rates
- Rub clean spray nozzles
- Pressure compensating flow regulation

**Auto-Diverting Tub Spout**
- Reduces warm-up waits by 2x or more
- Auto diverts hot water to the showerhead once it arrives
- Anti-leak tub spout design
- Includes WaterSense showerhead or handshower

**Handshower**
- Eliminates behavioral waste
- Pressure compensating performance
- Multiple spray patterns and flow rates
- Exceeds WaterSense standard
- Stainless steel hose
- Brass fitting

**Stainless Steel Hose and Shower Arm Mount**
How it works

1. Turn on hot water
   Cold water exits spout
   Continue with your typical routine - the things you do while waiting for the shower to become warm.

2. Auto diverts when hot water arrives
   Upon reaching 95°F, ShowerStart Technology automatically diverts flow. Showerhead trickles - saving hot water until you get in.

3. Pull cord when ready to get in
   Pull the cord to activate normal flow and begin showering.

4. Option: Taking a bath
   If a bath is preferred, simply push tub spout lever back to its original position.
Brief Technology Explanation - How A TSV Works

COLD EXITS

STOPS WHEN HOT

NORMAL FLOW SHOWER

STRUCTURAL WASTE

BEHAVIORAL WASTE

SHOWERING
Anatomy Of A Shower Warm-Up – Lawrence Berkley National Lab Data Analysis

WARM-UP WASTE

~40% of warm-up waste volume

~60% of warm-up waste volume


BATHER ADJUSTS TEMP DOWN FOR COMFORT (105 F – 100 F) & BEGINS SHOWERING
Anatomy Of A Tub Spout Warm-Up - Example

WARM-UP WASTE

ENTRY POINT

100 – 105 F
BATHING TEMP WATER

85%

Tub Spout Warm-Up
A Dramatic Impact On Eliminating Warm-Up Waste

Eliminates A Much Larger Percentage of Warm-Up Waste At A Much Higher Flow Rate

<table>
<thead>
<tr>
<th>SW</th>
<th>BEHAVIORAL WASTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>85%</td>
<td>at 5 gpm</td>
</tr>
</tbody>
</table>

5 gpm or more vs. 2.5 gpm or less
ADTS Is Efficient In Four Unique Ways

The product reduces structural waste, eliminates behavioral waste, provides an efficient shower and stops tub spout leaks while showering.

**REDUCES STRUCTURAL WASTE**

Higher warm-up velocity reduces thermal loss – less to purge before hot arrives.

**ELIMINATES BEHAVIORAL WASTE**

ShowerStart TSV integrated into TubSpout eliminates behavioral waste.

**PROVIDES EFFICIENT SHOWERING**

WaterSense certified showerhead saves water while bather is showering.

**STOPS LEAKING TUB SPOUT**

Positive, pressure sealed shut-off prevents TubSpout from leaking during shower.
Impact of Lower Flow Rates On Existing Structures

At lower flow rates, 50% - 100% more water must clear the pipe than is actually sitting in the pipe before hot water reaches the shower.

PLUG FLOW ( + 5 gpm)
- distance < 1 foot
- 0% - 10% more than volume of pipe

LONG BULLET ( 1-3 gpm)
- distance 5 – 10 feet
- 10% - 50% more than volume of pipe

HOT SLIDES UP OVER COLD ( <1 gpm)
- distance + 20 feet
- 50% - 100% more than volume of pipe


EPAct of 1992
water flow limits on toilets and fixtures
WaterSense Shower Heads Are Frequently In The Danger Zone

Real World Flow Rates

DANGER ZONE
increase of
50% to 100%
structural waste
20 Second Waits Are Now Becoming 3 Minutes!

**Up to 10x Increase in Wait Times**

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Shower Warm-Up Research - Survey Results

The majority of bathrooms have tub/shower combos, the tub spouts leak and multitasking while water is running out of the tub spout is common place.

62% TUB/SHOWER COMBOS
648 of the people surveyed reported that they typically shower in a tub/shower combination unit.

34% LEAKY TUB SPOUT
220 showering in a tub/shower combo unit report that their tub spout leaks during their showers.

40% TUB SPOUT WARM UP
258 people with tub/shower combo units warm their shower by letting the water run through the tub spout and activating the diverter AFTER the water becomes warm.

58% MULTITASK
149 people doing tub spout warm ups regularly or occasionally leave to do something else while waiting for the water to become warm.

multitasking during tub spout warm up causes significant waste

Tub Spouts Flow At 4 to 7 Gallons Per Minute
ADTS Savings Potential – California Centric Calculations

Savings should be adjusted based on regional behavioral waste times.
Savings should be adjusted based on factors for installation qualification.

- **ADDED TO BEHAVIORAL**
  - Structural Waste

- **5.5 GALLONS SAVED**
  - Behavioral Waste

- **5.0 GALLONS SAVED**
  - Efficient Showering

- **1.5 - 4.5 GALLONS SAVED**
  - Anti-Leak Tub Spout

**12 TO 15 GALLONS SAVED PER SHOWER**
Auto-Diverting Tub Spout System (ADTS) Product Family

ADTS +
Single Function Showerhead

ADTS +
Multifunction Handshower

ADTS For In Wall Diverters +
Multifunction Handshower
Special Considerations for In-Wall Diverter Systems

1. ATTACH HOSE TO TUB SPOUT

Hose Attaches To Tub Spout
Attach hose ends to Tub Spout and Hand Shower. The ShowerStart TSV Trigger should be attached closest to the Hand Shower.

2. ALWAYS SET TO DIVERTER TO “TUB”

note: failure to set to TUB will result in a stream of water flowing from the hand shower mount.
Case Study: Applegate Apartments, Frederick, MD

PROPERTY PROFILE

<table>
<thead>
<tr>
<th>Owner/Manager</th>
<th>Maryland Mgmt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Applegate Apartments</td>
</tr>
<tr>
<td>Location</td>
<td>Frederick, MD</td>
</tr>
<tr>
<td>Buildings</td>
<td>2</td>
</tr>
<tr>
<td>Apartment Units</td>
<td>156</td>
</tr>
<tr>
<td>ADTS Installation</td>
<td>Summer 2016</td>
</tr>
<tr>
<td>Pre Install SH Flow Rate</td>
<td>1.5 gpm</td>
</tr>
<tr>
<td>Post Install SH Flow Rate</td>
<td>1.5 gpm</td>
</tr>
<tr>
<td>Additional Water Measures Installed</td>
<td>None</td>
</tr>
</tbody>
</table>
Case Study: Applegate ADTS Water Savings Potential

- **Structural Waste**: 0.4 gallons saved
- **Behavioral Waste**: 5.1 gallons saved
- **Efficient Showering**: 0 gallons saved
- **Anti-Leak Tub Spout**: 4.5 gallons saved

*Picking up incremental shower head savings has the potential to increase total ADTS savings by up to 33%.*

Total water savings per shower: 10 gallons saved
# Case Study: Applegate Predicted Yearly Water Savings

<table>
<thead>
<tr>
<th>WATER SAVINGS VARIABLES</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apartment Units</td>
<td>156</td>
</tr>
<tr>
<td>Bathrooms Per Apartment</td>
<td>1</td>
</tr>
<tr>
<td>Persons Per Apartment</td>
<td>2</td>
</tr>
<tr>
<td>Shower's Per Person Per Day</td>
<td>0.75</td>
</tr>
<tr>
<td>Days Per Year</td>
<td>365.25</td>
</tr>
<tr>
<td>Occupancy Rate</td>
<td>0.91</td>
</tr>
<tr>
<td>ADTS Predicted Gal. Saved/Shower</td>
<td>10</td>
</tr>
</tbody>
</table>

**PREDICTION**

777,763 GALLONS SAVED PER YEAR
Case Study: 7% Total Water Use Reduction vs. Baseline

**Occupancy Adjusted Water Use (Gallons)**

- Water Use Year Prior To Installation: 11,234,157 gallons
- Water Use First Year After Installation: 10,448,803 gallons
- Year 1 Gallons Saved @ Applegate: 785,354 gallons
- Year 1 Percent Saved @ Applegate: 7%

**OCCUPANCY ADJUSTED ADTS SAVINGS**

- Water Use Year Prior To Installation: 11,234,157 gallons
- Water Use First Year After Installation: 10,448,803 gallons
- Year 1 Gallons Saved @ Applegate: 785,354 gallons
- Year 1 Percent Saved @ Applegate: 7%

*OCCUPANCY ADJUSTMENT*

To neutralize the impact of occupancy rate variances within the analysis, water use was adjusted to assume 100% occupancy using the following formula: \[ \text{actual gallons used} / \text{occupancy rate} \] = occupancy adjusted water use. Actual monthly occupancy rates during the measurement period ranged from 88% - 96%.
Case Study: Applegate Water/Sewer Savings Payback

**PAYBACK CALCULATIONS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water/Sewer Cost Per Gallon</td>
<td>$0.013</td>
</tr>
<tr>
<td>ADTS Cost</td>
<td>$60.00</td>
</tr>
<tr>
<td>Gallon Cost Per ADTS</td>
<td>4,631</td>
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<tr>
<td>ADTS Units Installed</td>
<td>156</td>
</tr>
<tr>
<td>Gallon Savings Required To Break Even</td>
<td>722,498</td>
</tr>
<tr>
<td>Year 1 Gallon Savings – Occupancy Adjusted</td>
<td>785,354</td>
</tr>
<tr>
<td>Payback Months – Occupancy Adjusted</td>
<td>11</td>
</tr>
<tr>
<td>Year 1 Gallon Savings</td>
<td>996,300</td>
</tr>
<tr>
<td>Payback Months</td>
<td>9</td>
</tr>
</tbody>
</table>

**PAYBACK IN LESS THAN 1 YEAR ON WATER SAVINGS ALONE**

- does not consider energy savings
- does not consider shower head savings
Case Study: Applegate Water/Sewer Savings ROI

**Occupancy Adjusted Water/Sewer Cost**

<table>
<thead>
<tr>
<th>Year Prior To Installation</th>
<th>First Year After Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10,174.31</td>
<td>$10,174.31</td>
</tr>
</tbody>
</table>

**ADTS ROI ANALYSIS**

- Annual Water/Sewer Bill Savings: $10,174.31
- ADTS Cost Per Unit: $60.00
- ADTS Units Installed: 156
- ADTS Cost Of Investment: $9,360
- ADTS Est. Useful Life - Years: 10
- ADTS Gain From From Investment: $101,743.07
- ROI (Yr 1): 108.7%

ROI = Gain From Investment / Cost Of Investment. First year’s savings only.
# Case Study: Applegate Annual Energy Savings Projections

## Assumptions:
- 2 persons per apartment
- .75 showers per person per day
- 56.8°F avg. water mains temp
- 105°F – 101°F showering temp range
- $.13 per kWh (chooseenergy.com)
- $1.14 per Therm (energy-models.com)

<table>
<thead>
<tr>
<th>Structural &amp; Behavioral</th>
<th>Shower Head</th>
<th>Anti-Leak Tub Spout</th>
<th>Per Unit Energy Saved</th>
<th>Units Installed</th>
<th>Occupancy Rate</th>
<th>Total Energy Savings</th>
<th>Total $ Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>323 kWh</td>
<td>0 kWh</td>
<td>281 kWh</td>
<td>604 kWh</td>
<td>156</td>
<td>85,744 kWh</td>
<td>$11,147</td>
</tr>
<tr>
<td>Gas</td>
<td>14.2 Therms</td>
<td>0 Therms</td>
<td>12.4 Therms</td>
<td>26.6 Therms</td>
<td>156</td>
<td>3,776 Therms</td>
<td>$4,305</td>
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</tbody>
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Additional Installation Benefits – Green Loans & CPACE

- Preferential Loan Pricing
- Free energy and water audit paid by Fannie Mae
- Additional loan proceeds

Property owner must commit to property improvements that are projected to reduce the whole property’s annual energy and/or water consumption by at least 30%, inclusive of at least a 15% energy consumption reduction.
Additional Installation Benefits – LEED Points

12 POINTS
WE c Total Water Use Homes/Midrise

6 POINTS
WE c Indoor Water Use Reduction BD+C: New Construction

ShowerStart TSV
Contributes To Earning Up To
Thank You

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