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Eugene Water & Electric Board

Irrigation Retrofits to Manage Peak Hour Demands

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5/14/2010

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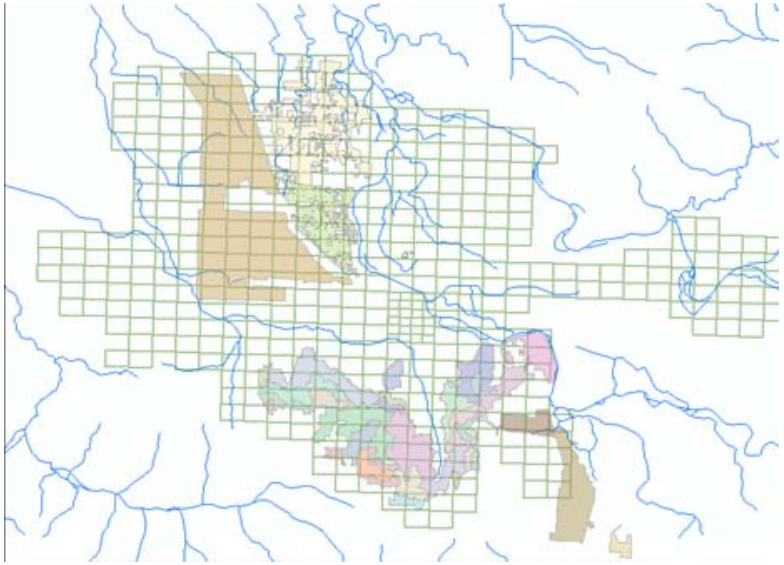
Background

- In the Southern part of the City we have numerous pressures zones
- Require pumping
- Pumps can only handle given amount of flow
- Distribution system is designed to supply water for only a few hours of max flow during July and August
- Reducing peak hour demand reduced costly infrastructure costs
- The 3 Studies are to determine feasibility of reducing peak hour demand
    - How
    - With what
    - Does it last
- Will Talk about Lessons Learned, Peak Hour reduction potential, costs, and possible water savings.



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Background (continued)

- Educated about the MSMT-MPR Nozzles in 2007 at the Walla Walla PNWS-AWWA conservation committee meetings
- Toured MPRotator factory at Nelson Irrigation

Walla Walla Sprinkler Company

A subsidiary of Nelson Irrigation Corporation

Background (Continued)

What prompted studies

- Read paper by Dr. Kenneth Soloman on conservation potential for MSMTR nozzles that was printed in the 2007
- Found retrofitting existing systems could increase distribution uniformity by 26%
- Product literature stated a .41 in/hr application rate, much less than conventional spray systems

What we wanted to know

- How reduction in application rate would effect peak hour demands
- Wanted to find out if product lived up to the hype
- Are the nozzles reliable
- Curious to find out improved efficiency and water savings

2007 Retrofits at EWEB: Preliminary Study

- Fountain area was using Rainbird VAN nozzles
- Fixed broken heads etc.
- Performed pre audit
- Replaced with MpRotator Side strip MP1000, Corner strip and MP 2000 Nozzles
- Nozzles were donated by Ewing Irrigation Products
- Performed follow-up audit

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2007 Retrofits at EWEB

Parking lot Park strip

- Very narrow park strip
- Rainbird 8 ft nozzles in 5 ft park strip
- Areas in asphalt are damaged where water once pooled and ran off, may or not be cause of damage
- Installed MP corner and MP Strip Nozzles.

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Results

Fountain Lawn

- DU_{LQ} Before retrofit
  - 57%
- DU_{LQ} After Retrofit
  - 78%
- A 21% improvement!
- Could not data log to determine flow rate

Park Strip

- DU_{LQ} Before retrofit
  - 53%
- DU_{LQ} After retrofit
  - 59%
- A 6% improvement
- Much less water on the sidewalk and pavement

Results (Continued)

- In spring 2008 and 2009 landscape crew replaced all nozzles because they were clogged with grass roots.
- Later in summer of 2009 I replaced half the nozzles again due to root intrusion

Lesson Learned #1

- Perhaps is not the best product to be used where vigorous root growth and or rhizome growth are prevalent during the winter months.
- Improve distribution uniformity

Concerned Homeowners – 2008 Customer Study #1

- In June of 2008 a customer called, inquiring about possible rebates for MSMT-MPR nozzles.
- Decided we needed a pilot study
  - Created study parameters for customer and 2 neighbors

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Study Goals

- Determine the flow rate reduction through retrofit.
- See if pressure compensation has effect on flow rate and efficiency
- Calculate the DU_{LQ} before and after the retrofit
- Measure water savings and product reliability over time
- Find out if customers kept their new schedules of watering outside peak hours.

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Study Parameters

- Before and after audits performed by EWEB staff
- Homeowner install new sprinkler bodies – 40 psi with check valves and multi-stream nozzles
- Customers failed to complete in timely manner
- EWEB staff finished installation.

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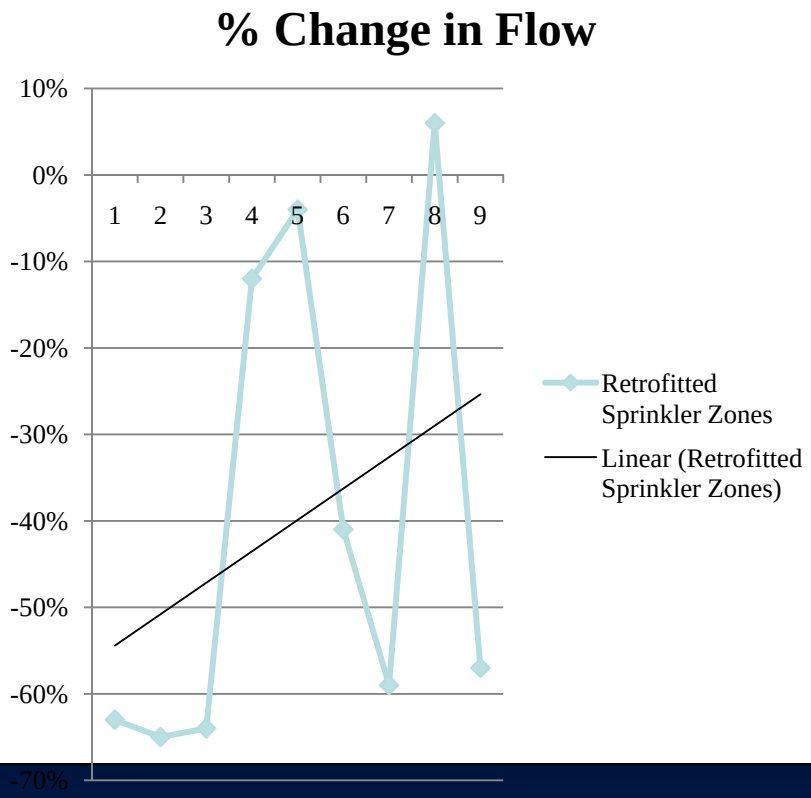
Results 2008 Customer Study #1 (Continued)

Flow Rate Analysis



Process

- Data logger used to measure before and after flow rates of sprinkler zones.
- Measurements taken during day and night
- Flow rate reduction averaged 45% but 5 of the 9 zones showed more than 55% reduction in flow

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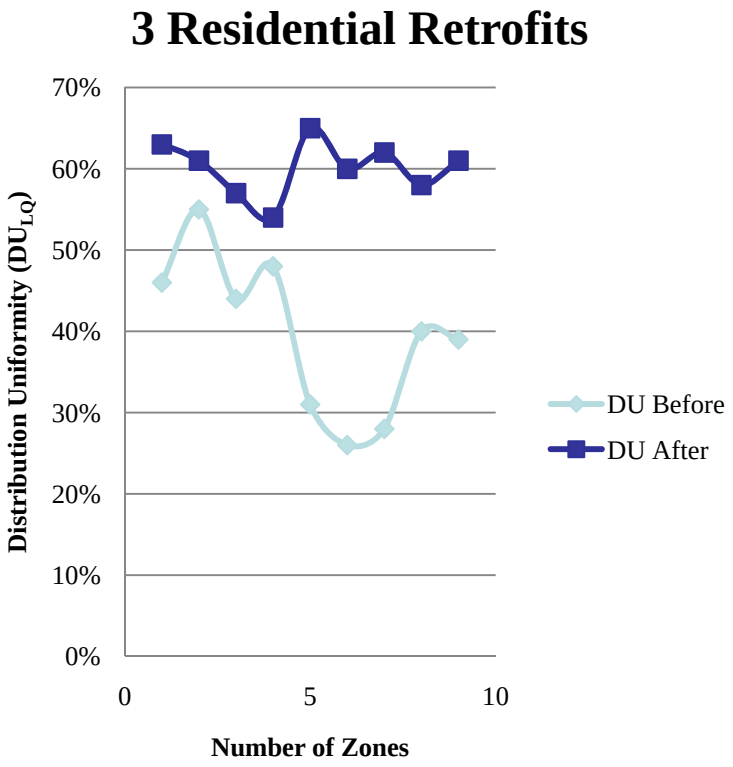
Results – 2008 Customer Study #1

- Maximum DU_{LQ} change was: 34%
- Minimum DU_{LQ} change was 6%
- Each sprinkler head was regulated at 40 psi
- Highest flow reduction and DU_{LQ} found when regulating pressure



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Lessons Learned # 2

- Could not rely on customers to install product properly, or in a timely manner.
- Using pressure compensating sprinklers had the greatest effect on reducing peak hour demand
- Pressure compensation also increased DU_{LQ} more than installing MSMT-MPR nozzles alone

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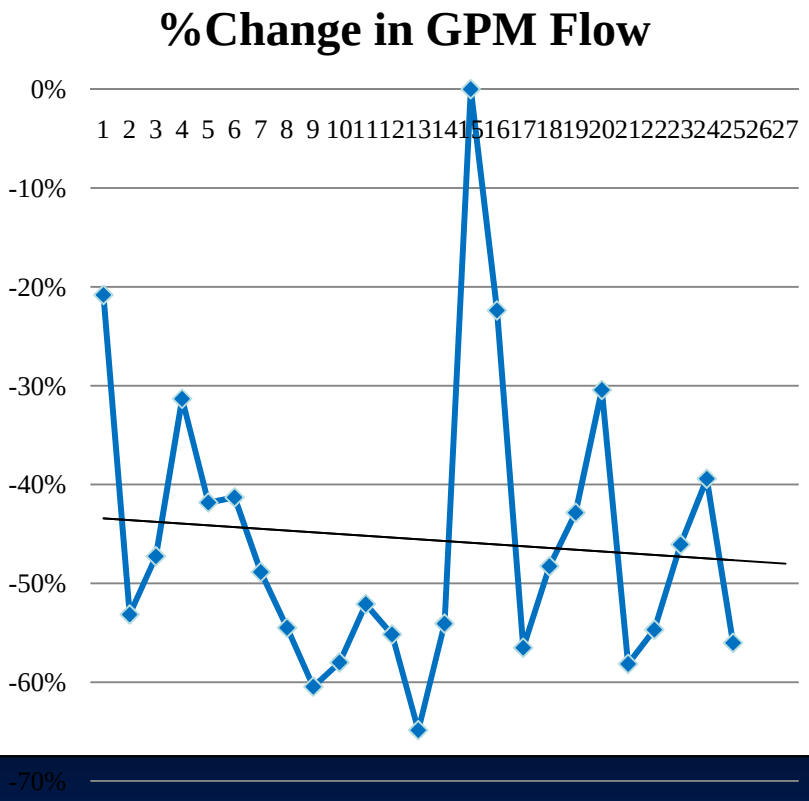
2008 Customer Study # 2

- Offered MSMT-MPR Nozzles to customers that had previously received audits
- One landscape contractor showed interest and retrofitted 7 small commercial properties.
- Only nozzles were offered for rebate, contractor purchased and installed nozzles, EWEB performed initial and follow-up audit of each property. Some audits performed 3 years earlier, not audited again
- Only Lawn Zones were retrofitted at this time

Results Continued– 2008 Customer Study #2

Flow Rate Analysis

- Change in flow rate is dramatic.
- Average flow reduction of 45%
- Great method for reducing hourly peak if irrigation is main concern for certain area of distribution system, or entire distribution system



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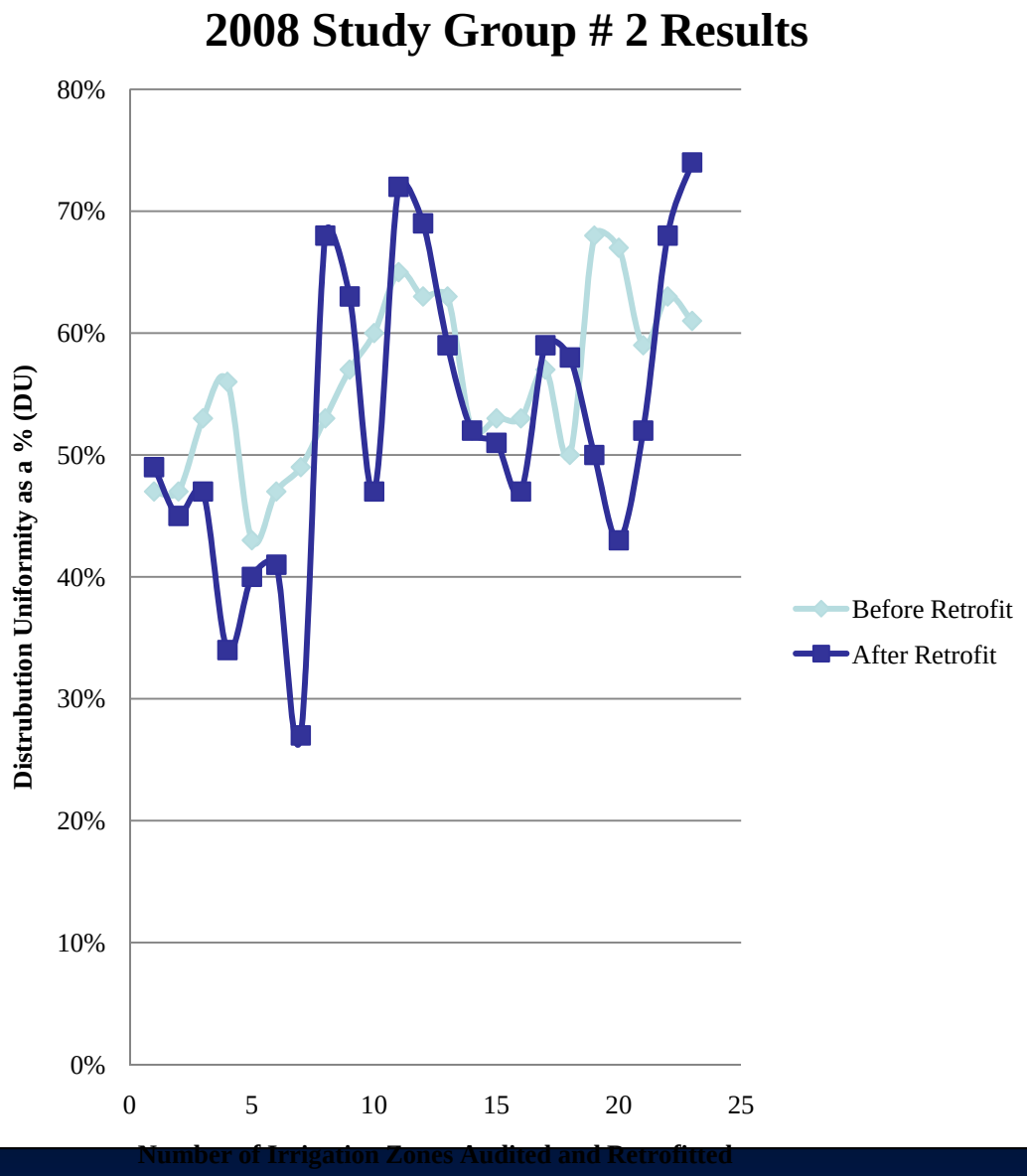
2008 Customer Study # 2

- Distribution Uniformity did not improve very much in this group of retrofits.
- Audits not performed same year as retrofit.
- Systems not in same condition during audit and retrofit.
- 23 Zones audited and retrofitted
- Change to DU was -3% for the 23 sprinkler zones



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Lessons Learned – 2008 Customer Study # 2

- Make sure flow rates are measured precisely for the same zones before and after retrofit
- Variability in results may be due to poor data collection
- Perform audits immediately before retrofits will be performed
- Perform follow-up audits immediately after retrofit is completed.
- When auditing retrofits on park strips, bury catchment cups as close to soil level as possible.

Summer 2009 MSMT-MPR Sprinkler Nozzle Retrofit Study: The real deal

- Created a Request for Qualifications (RFQ)
- Wrote contract
- Asked for Qualifying contractors to participate
- 2 contractors qualified
- 1 contractor performed work
- Worked with our Risk Management Department to create proper contracts

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2009 Study Goals

- Reduce hourly peak flow by changing start times and reduced flow rate of MSMT-MPR nozzles
- Calculate the change in DU_{LQ}
- Evaluate retrofits for 3 years to determine longevity of nozzles
- Determine water savings for each year after retrofit
  - Water Budget Spreadsheet which links billing week and weekly ET for an accurate assessment of water savings

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Contractor Qualifications

- Qualifications
  - Be certified Irrigation Auditors with the Irrigation Association (IA)
  - Have proper licensure and insurance

Study Scope of Work

- Certified auditor must be present during all audits
- Retrofits performed on lawn and shrub areas
- Only offered to customers with existing spray type sprinkler systems
- Preliminary audit performed by contractor
- Contractor purchased and installed MSMT-MPR nozzles then contact EWEB when complete
- EWEB set up secondary audit.
- $350 Maximum for each zone for audit labor $2,000 max for each site
- $500 Maximum for nozzles, and $500 maximum for installation labor.
- Itemized invoice and copy of original vendor receipt.

Scope of Work (Continued)

- After Retrofit and Audit
  - Personalized report given with specific schedule
  - Contractor changed watering times to water outside the peak hours to between hours of 9 p.m. and 3 a.m. and 9 a.m. and 3 p.m.
  - Gave suggested run times, but did not confirm if contractor changed run time lengths

Results

- The numbers
  - 23 sites retrofitted in 2009
    - 17 residential, 5 commercial, 1 institutional
  - One contractor performed all audits and retrofits, chose to use only one MSMT-MPR manufacturer
  - 134 sprinkler zones retrofitted
  - 39 lawn zones audited
  - DU improvement 9% on average, high of 25% and low of -8%
  - Flow rate reduction of 45%, 50% with outliers removed
  - All customers who replied to our survey were satisfied

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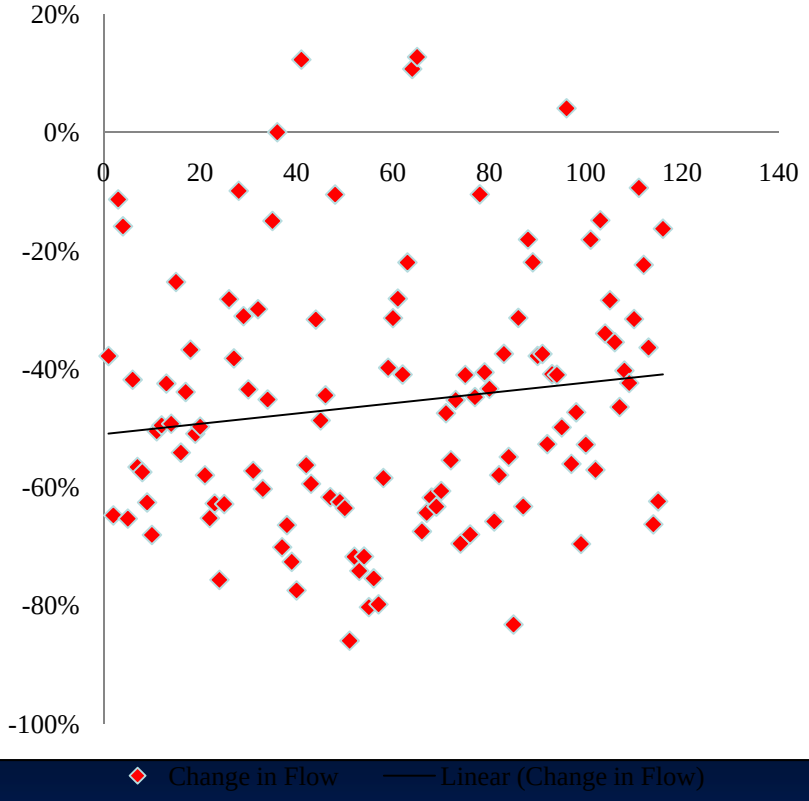
Summer 2009 MSMT-MPR Sprinkler Nozzle Retrofit Study: Results (Continued)

Flow Rate Analysis

- Average Change of flow was 45% or 50% with outliers removed
- Most reduction was 86% the least was an increase in flow of 13%



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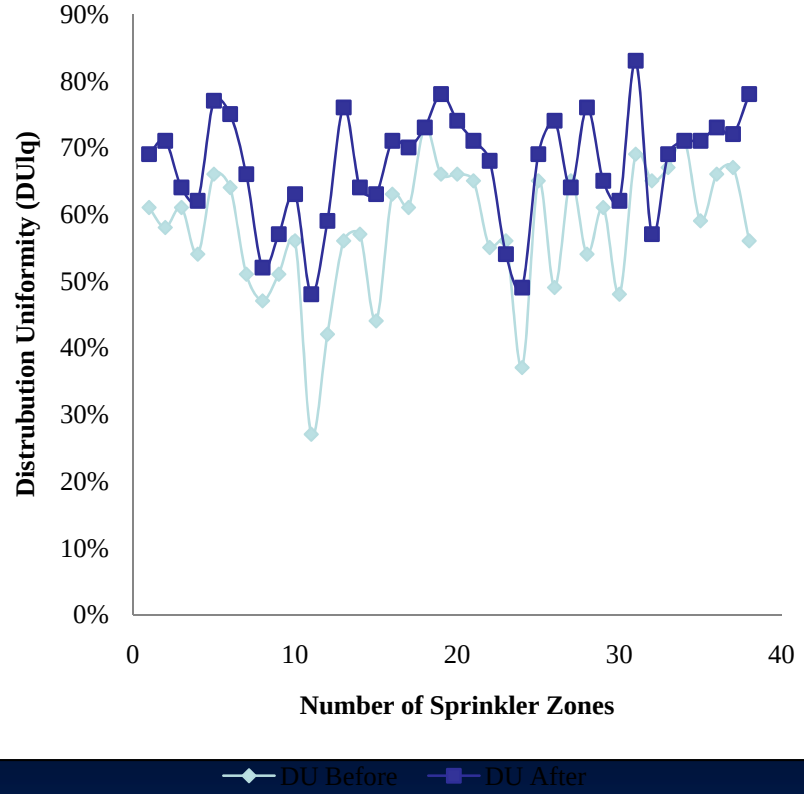
Summer 2009 MSMT-MPR Sprinkler Nozzle Retrofit Study: Results Continued

Distribution Uniformity



- The average change in DU_{LQ} = 9% improvement
- The average DU_{LQ} before retrofit was 58% DU_{LQ}
- The average DU_{LQ} after retrofit increased to 67% DU_{LQ}

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Costs

- Total cost of 23 retrofits = $31,816.30

Audit	Nozzles	Labor	Total Cost	Cost Per GPM (installed)	Cost Per GPM rebate
$14,732.30	$6,866.30	$10,215.00	$31,813.60	$20.20	$8.12

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2008 Study Participants: Water Savings Results 1 year after retrofit

- **7 Commercial Customers**
  - With only a $3,312.54 investment in nozzles
  - Saved 153,000 gallons in July and August
  - Average of 33,000 per customer (54% reduction in water use)
- **3 Residential Customers**
  - Used an average of 25,000 more during July and August

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Conclusions

- Do they work?
  - Dramatic reduction in hourly peak demand or by reducing flow rate by 45% and increasing run times
  - Water Savings – too early to really tell, but so far average of commercial properties saw a reduction of 54% in consumption for July and August (2008 Study)
  - Residential saw an increase of 95%
    - Only 3 properties, one has lateral line leak (2008 Study)
  - Distribution uniformity is improved – For all zones retrofitted in the three studies
    - 9% DU_{LQ} Improvement

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Conclusions (Continued)

- All customers who responded to our participant survey were very happy with their participation and with the product
- Customers loved to hear about the increased Distribution Uniformity, but did not care about the reduction in flow rate of the nozzles.
- A few customers notice visible results in the color an vigor of the lawn within a week of the retrofit
- If possible –
  - Be nice to have more participants in study to se if variability is reduced.
  - However, we know that efficiency is improved, flow rates are significantly reduced and customers really show signs of saving water.

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Conclusion (Continued)

- Will reduce peak hour
- Questions of reliability
- Pressure Compensation increases peak hour reduction and distribution uniformity
- MSMT-MPR Nozzles will only work to reduce peak hour demands if they are installed in retrofit situations, not in new installations.

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Other possible Retrofits

- Installing pressure compensation heads with or without MSMT-MPR nozzles
- Retrofit existing spray systems to drip systems
  - Reduced pressure
  - Reduced application rates
  - Reduced run off
  - Increased runtimes

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Rely on us.

QUESTIONS?

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