

Drain Water Heat Recovery

What about the potential ?

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Today's Presentation

- > **Electric water heating in Quebec**
- > **Heat recovery technologies**
- > **Some lab results**
 - Instantaneous performance
 - Annual savings projection
- > **Some statistics**
 - Number of showers
 - Length of showers
 - Hot water Energy Consumption

Heat recovery technologies

> Many concepts, many patents, not so much products

- Grease, soap and everything else...
- Avoid clogging, maintenance
- Water use and drain
 - Batch process (Bath, dishwasher, etc)
 - Simultaneous (Shower, Hand wash, etc)

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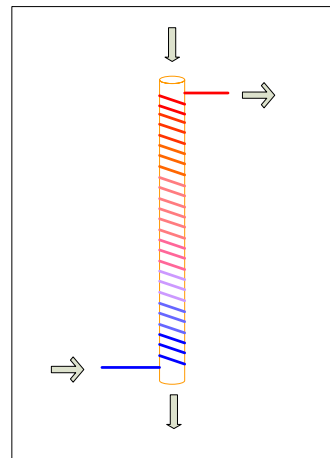
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Heat recovery technologies

> Working Principles

- Transfer heat from waste to incoming water
- Preheated water can supply
 - Water heater and/or
 - Cold tap shower
- Works only for simultaneous draw and sink usages (showers...)



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Lab testing (2007)

- > **Tested 40 & 60 inches units**
- > **Protocol included**
 - Showers (2)
 - Bath
 - Dishwasher & clothe washer cycle
 - Toilette flushes
 - Hand washes, etc
- > **220 liters (58 US gal) @ 60°C (140 °F)**



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Lab testing (2007)

- > **45 to 53 % instantaneous performance**
 - For equal flow configuration
- > **869 to 1021 kWh/yr of saving**
 - 700 to 900 \$ investment
 - More than 10 years payback @ 0.07 \$/kWh
 - Net Present Value positive
 - No maintenance
 - Long life expectancy

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Lab testing (2007)

- > **Cross-effects** (heat coming from ambient air)
 - Not important
- > **Annual savings sensible to assumptions**
 - Number of showers

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Lab testing (2010)

- > **Impact of some installation variations**
 - Insulation
 - No significant impact
 - Drop height (Shower often on 2nd floor and DWHR in basement)

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Some statistics (from EWHD)

> Energy Wise Home Diagnostic

- Web tool helping customer to better understand their electric consumption and to promote energy saving
- Based on customer Inputs, Electric bills & Weather data
- More than a million customer since 2003

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Some statistics (from EWHD)

> Number of showers/week

Nb Occupants	Single family	Duplex & triplex	Apartments
1	5.36	5.42	5.56
2	8.96	9.19	9.48
3	13.49	13.21	13.00
4	16.64	15.88	14.06
5	19.14	17.69	15.89

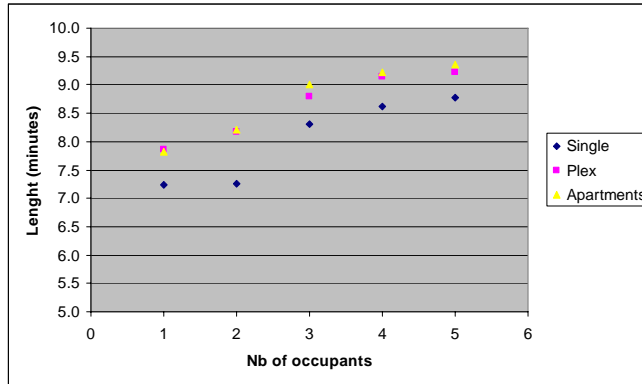
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Some statistics (from EWHD)

> Average length of showers



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Some statistics (from EWHD)

> Averages/week

	Single	Plex	Apartments	Weighted Average
Number of showers	12.20	9.88	8.48	10.94
Total time	99.07	84.07	70.57	89.87
Average length	8.12	8.51	8.32	8.23

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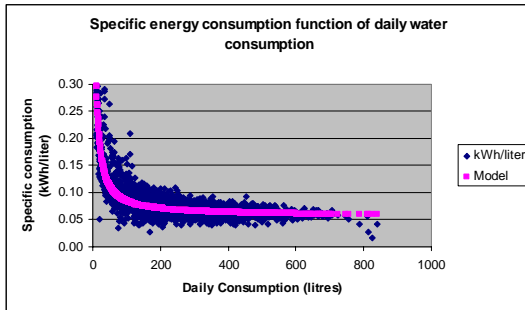


Some statistics (from EWHD)

> From hot water consumption to Energy consumption

- 59 Customers

- January to April 2007



$$Q_{Model}/m = C_p \Delta T + \beta/m$$

$$\Delta T = 48.2 \text{ }^\circ\text{C} \text{ (119 }^\circ\text{F)}$$

$$\beta = 2.87 \text{ kWh/jr (120 W)}$$

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Some statistics (from EWHD)

Energy consumption for Showers (kWh/yr)

9.5 l/min (2.5 USGPM)

Incoming water @ 12 °C (54 °F)

Shower @ 40 °C (104 °F)

	Single	Plex	Apartments
1	627	689	701
2	1 051	1 211	1 255
3	1 807	1 877	1 892
4	2 313	2 347	2 094
5	2 708	2 633	2 401

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Some statistics (based on EWHD model)

Total hot water consumption (kWh)

Nb Occupants	Single	Plex	Apartments
1	2234	2050	2006
2	3154	3002	2935
3	4306	4050	3917
4	5237	4936	4508
5	5960	5567	5115
Weighted average	4 035	3 803	3 076

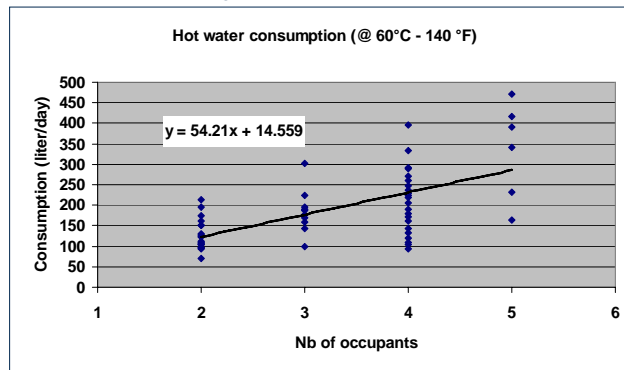
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Some statistics (From pilot project)

59 customers, January to April 2007



- Smaller than standard reference (ASHRAE)
- 156 vs 236 liters for 2.6 occupants

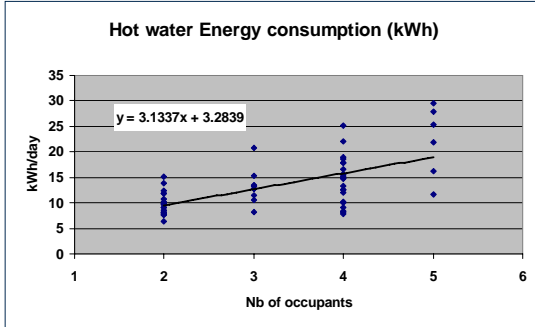
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Some statistics (From pilot project)

59 customers, January to April 2007



- Larger than EWHD
- But worst part of the year (Jan to Apr)

Hot water Energy consumption (kWh/yr)

Nb Occupants	EWHD	Pilot
1	2234	2344
2	3154	3489
3	4306	4630
4	5237	5774
5	5960	6918



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