Heat energy recovery from waste water

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Overview

1. Scope summary
2. Surveys & technology research
3. Feasibility study & options
4. Future steps
5. Q & A
1. Scope summary

Subway System

21 sumps
1. Scope summary

Initial scope to manage the water by investigating the possibility to produce heat energy through this element (April 14)

Research – measurements – investigation (May to Nov. 14)

Feasibility study & options report (July to Nov. 14)

Trial decided (Dec. 14)

System’s installation (exp. June 15)
2. Surveys & technology research

Monthly measurements of the water flux and temperature in each sump (May 14 to date)

- Water flow survey
2. Surveys & technology research

Water chemical analysis

Samples were collected from all 21 sumps (July 2014)

Water analysis was undertaken for 6 samples (July 2014)

Results: No issue for special specs. for a heat pump (Aug. 2014)

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# 3. Feasibility study & options

- **Heat load calculations**

<table>
<thead>
<tr>
<th>Station Name</th>
<th>Total design heat load</th>
<th>Station Name</th>
<th>Total design heat load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W (W)</td>
<td>kW</td>
<td></td>
</tr>
<tr>
<td>Hillhead</td>
<td>6641</td>
<td>6.6</td>
<td>Shields Road</td>
</tr>
<tr>
<td>Kelvinbridge</td>
<td>4755</td>
<td>4.8</td>
<td>Kinning Park</td>
</tr>
<tr>
<td>St. Georges Cross</td>
<td>5185</td>
<td>5.2</td>
<td>Cessnock</td>
</tr>
<tr>
<td>Cowcaddens</td>
<td>3369</td>
<td>3.4</td>
<td>Ibrox</td>
</tr>
<tr>
<td>Buchanan Street</td>
<td>4778</td>
<td>4.8</td>
<td>Govan</td>
</tr>
<tr>
<td>St. Enoch</td>
<td>4706</td>
<td>4.7</td>
<td>Partick</td>
</tr>
<tr>
<td>Bridge Street</td>
<td>4577</td>
<td>4.6</td>
<td>Kelvinhall</td>
</tr>
<tr>
<td>West street</td>
<td>4029</td>
<td>4.0</td>
<td>Buchanan Bus Station</td>
</tr>
</tbody>
</table>

**Calculations accord. BS EN 12831-2003 (Oct. – Nov. 14)**

- Establish thermal need for each station (Nov. 14)
- Define the appropriate system (Nov. 14)

**Govan station drawings with proposed radiators after heat load calculations**
3. Feasibility study & options

Water sourced solution

- Feasibility study & options report (Nov 14)
- Options workshop (Dec 14)
- Trial site selected (Dec 14)
- Water
3. Feasibility study & options

- Design & specifications for trial location (St. George’s Cross)

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>Cost / Unit</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water source heat pump</td>
<td>1 piece</td>
<td>£12000</td>
<td>£12000</td>
</tr>
<tr>
<td>Radiators</td>
<td>4 pieces</td>
<td>£400</td>
<td>£1600</td>
</tr>
<tr>
<td>Civil works</td>
<td>30m</td>
<td>£60</td>
<td>£1800</td>
</tr>
<tr>
<td><strong>Total (± 20%)</strong></td>
<td></td>
<td><strong>£15400</strong></td>
<td></td>
</tr>
</tbody>
</table>

### High level supply costs

<table>
<thead>
<tr>
<th>St. Georges Cross</th>
<th>Thermal needs (kW)</th>
<th>Input (kW)</th>
<th>Output (kW)</th>
<th>Cost / year (210 d/16h/days)</th>
<th>CO₂ emissions (kg/kW)</th>
<th>By-product</th>
<th>Payback period (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 electric radiators</td>
<td>5.2</td>
<td>12</td>
<td>12</td>
<td><strong>£4050</strong></td>
<td>0.47</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>GSHP (sump 1)</td>
<td>3</td>
<td>8</td>
<td>8</td>
<td><strong>£510</strong> (65% less)</td>
<td>0.16 Air conditioning</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

VAT and installation cost in not included.
4. Future steps

1. Monitoring – feedback
2. Lessons learned
3. Energy use assessment
4. Scale it up to further stations

- Energy use assessment using the heat map (St George’s Cross)
6. Q & A

IF YOU CHANGE NOTHING, NOTHING WILL CHANGE

Thank you