INTRODUCTION
This project concerns heat recovery systems from the large sewers. The average amount of energy required for heating the water in a single home is estimated to be around 80kWh/year\(^1\), assuming an average per capita consumption of 150 l/d\(^1\). The energy consumed for delivering the water to the houses including the pumping is 0.5 to 1kWh/m\(^3\) per property. The water that enters the buildings is heated from 10°C to 45°C for dishwashing, laundry and showering. The total energy consumption for year round heating of water is estimated as 1.7MWh/year\(^1\), taking into account an average use of 100l/d/person, as the stated rise in temperature requires 47kWh/m\(^3\).\(^2\)

This project is based on the study of sewage heating technology currently being commissioned at the Borders College of Galashiels and was done as an internship with the SHARC Energy Systems. This project report highlights the basic working principle of relatively new technology of producing heat energy from the raw sewage. This technology proves to be technically and economically feasible. As, this technology will save Borders College approximately £10,000 per year for the next 20 years. This technology is also environmentally friendly as it reduces the carbon emissions to the atmosphere by 140 tonnes/year.

Wastewater carry large amount of heat out of the buildings. This heat source has the potential of supplying the energy that can exceed the sum of the solar, wood and biomass energy potential. This energy can provide for the solutions of energy problems in various parts of the world as it is the renewable form of energy.

The average sewage water temperature coming out of the homes in UK is 15°C as an average on the yearly basis, though this temperature varies between 20-25°C in summer and 10-15°C in winter. This sewage heat can be recovered saving a large amount of energy required for heating the water and air by the use of heat exchangers and heat pumps. The reuse of sewage water for heating is very environmentally friendly, as its source is available on a regular and renewable basis.

TECHNOLOGY USED FOR SEWAGE HEAT RECOVERY AT BORDERS COLLEGE

**REFERENCES**


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**Table 1: CARBON EMISSION SAVINGS**

<table>
<thead>
<tr>
<th>Fuels</th>
<th>Carbon emission equivalent (kgCO₂e/kWh)</th>
<th>Energy Consumption (kWh)</th>
<th>Carbon emission (tonneCO₂e per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>0.18445</td>
<td>1,872,305</td>
<td>345.345</td>
</tr>
<tr>
<td>SHARC energy requirement</td>
<td>0.46219</td>
<td>1,778,690</td>
<td>205.523</td>
</tr>
<tr>
<td>Carbon Emission Savings</td>
<td></td>
<td></td>
<td>139.822</td>
</tr>
</tbody>
</table>

**CONCLUSION**

The use of raw sewage is beneficial: on the one hand as it provides for higher inlet temperature of around 14°C - 18°C (Data from SHARC Systems) as an average around the year. The following are the main conclusions that can be drawn out of the study of this project as:

- The use of this technology provides for the sustainable development.
- This project estimated reduction of CO₂ emissions is around 140 tonnes/year.
- The monetary savings by the college per year sums up to around £10,000 per year on their bills for heating by using SHARC system in comparison to use of gas boilers for heating of the buildings.