

**REDDITCH BOROUGH COUNCIL**

**EXECUTIVE  
COMMITTEE**

1st February 2011

**CREMATORIUM ENERGY RECOVERY PROJECT**

Relevant Portfolio Holder	Councillor Brandon Clayton, Housing, Local Environment & Health
Relevant Head of Service	Guy Revans, Head of Environmental Services
Key Decision	

**1. SUMMARY OF PROPOSALS**

Members' approval is sought to utilise waste heat which will be generated as a result of an equipment upgrade at the Crematorium. The upgrade is required to ensure the Council complies with new legislation concerning mercury emissions to the atmosphere. The process of mercury abatement requires heat to be removed from the flue gases before their treatment and this is then dissipated via a cooling water circuit. Members are asked to consider the re-use of this waste heat to offset the significant gas requirements required for the new Abbey Stadium development, rather than allow the heat to escape into the atmosphere.

**2. RECOMMENDATIONS**

The Executive Committee is asked to **RECOMMEND** that

- 1) **£40,000, a proportion of the capital sum already approved for the installation of mercury abatement and cremation equipment, be redirected to the Abbey Stadium development project, to fund the engineering process associated with recommendation 2; and**

**subject to which, to RESOLVE that**

- 2) **any waste heat recovered as part of the flue gas cleaning process at the crematorium be used to supplement the heating requirement of the Abbey Stadium development; and**
- 3) **expenditure of up to the sum agreed by the Council at 1) above be approved in accordance with Standing Order 41, for the purposes defined in the report.**

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**3. BACKGROUND**

- 3.1 Bereavement Services has existing approval and funding to carry out a major equipment and buildings upgrade at the Crematorium in Redditch. Works include the installation of one new cremator with the associated mercury abatement equipment (required by new legislation) and the internal reuse of part of the waste heat from the flue gases.
- 3.2 In order to remove mercury from flue gases which are generated as part of the cremation process, the flue gases must be substantially cooled down, from over 800<sup>0</sup>C to around 140-160<sup>0</sup>C – which is a significant amount of heat energy loss. Once cooled, the flue gases are cleaned in the abatement plant to remove mercury, acids and particulate and are then evacuated to the atmosphere via the chimney. The heat energy recovered by this process is dissipated to the atmosphere via a separate cooling water circuit air blast cooler.
- 3.3 Operating a crematorium is a highly energy intensive process and in 2008, 170,000 kilowatt hours (kWh) of electricity and 1,516,000 kWh of natural gas was used. The energy needed for a typical 80 minute cremation releases to the atmosphere an average of 300 kW (high 400 kW, low 200 kW) of waste heat as part of the process. At present this heat energy is dissipated with the untreated flue gases via the chimney to the atmosphere and is lost.
- 3.4 With the mercury abated cremation there is an average of 280 kW of heat which must be removed from the flue gases as part of flue gas cleaning process. This lower figure is due to the fact that with the more efficient cremator fitted with mercury abatement technology, the operating temperature is lowered from 850<sup>0</sup>C to 800<sup>0</sup>C. In an abated system without any heat recovery, this energy would still be dissipated to the atmosphere via a separate abatement cooling system.
- 3.5 New cremators are far more technologically advanced and efficient than previous systems having shorter preheat times, greater heat retention and have the option to recover any heat from the secondary process (i.e. from the mercury abatement equipment – not from the cremator itself).

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**4. KEY ISSUES**

- 4.1 There are at least three existing examples in Hastings (East Sussex), Tameside Councils (Manchester), and Calderdale (West Yorkshire) who have already installed mercury abatement equipment, who are currently using a proportion of the heat energy in this way for internal use in their crematoria reusing the recoverable waste heat to heat their local buildings (although this only uses a small percentage of the waste heat available). This is not the preferred option for Redditch Crematorium, as this would involve a complete change of the heating system, which is currently run on electricity; secondly it would not utilise all of the available waste heat.
- 4.2 In Redditch the Crematorium is located very close to the Abbey Stadium development which could potentially utilise the waste heat. The new development is large enough to be capable of being utilised as a 'heat sink' for all of the waste heat energy recovered from the flue gas. As far as Officers are aware, it is believed that this specific and innovative project is unique in its nature within the United Kingdom.
- 4.3 Members should note that on the Continent, Planning Permission for new Crematoria often stipulates the requirement for an adjacent development which can utilise the waste heat.
- 4.4 It was late on in the Abbey Stadium development programme that the idea of using this waste heat was discussed with the project managers and it was decided that more research would need to be undertaken to provide an engineering solution.
- 4.5 This work has now been done and it shows that the waste heat recovered from the flue gas can be used with very little alteration to the existing Abbey Stadium plan, other than a change to a piece of equipment in the plant room. The technology currently exists to use and transport any recovered waste heat energy to the site.
- 4.6 In order to remove mercury from the flue gases, the reuse of waste heat, it is essential that the flue gases are cooled significantly to remove the mercury. The waste heat recovered from this cooling process can be used in the new Abbey Stadium by installation of a means of transferring the heat from the abatement plant water cooling circuit to the leisure facility and to accept the cool return flow.

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- 4.7 The additional equipment for the stadium would be a water circuit from the crematorium comprising a delivery and a return pipe circuit, a water pump and a simple plate heat exchanger.
- 4.8 The pipe circuit from the crematorium would be a simple insulated pipe run underground. This would not disrupt any existing cemetery or grave site.
- 4.9 The initial work completed shows that there should be significant savings both in capital and energy saving costs for the stadium project. If the scheme does not go ahead, there will be additional costs incurred to the Abbey Stadium project (see 5.9).
- 4.10 It should be emphasised that there is no direct contact between the flue gases and the water in the abatement plant cooling circuit. Nor is there direct contact between the water in the abatement plant cooling circuit and the water in the leisure centre heating circuit.
- 4.11 It is fully recognised that a subject of this nature associated with bereavement services, will need to be sensitively handled, to ensure that the full facts are made available to local residents in order to explain the process and ensure that the technology is not misunderstood.

## **5. FINANCIAL IMPLICATIONS**

- 5.1 As part of the original Council decision to fund the mercury abatement and cremation equipment, it was agreed at Full Council (September 2009) to also set aside £70,000 for the internal reuse of recovered waste heat energy. A proportion of this funding could be re-directed to the Stadium side of the engineering requirements.
- 5.2 The capture of flue gas waste heat based on the current operation (250 operating days of 8 hours) of the crematorium would be the equivalent of 280kWth/hour. At current gas prices of £0.026\* per kWh (which is expected to rise in the future), this means that the Council reduces gas fuel charges at the Abbey Stadium by £14,560 per annum. Additionally this avoids the use of a significant amount of non-renewable fossil fuel, which has widespread environmental benefits.

\*The crematorium currently pays 1.97pence per kWh of gas used; however, when the current supply contract ends, due to gas wholesale prices rising significantly at the moment; the mean average of all RBC gas costs (2.6pence/kWh) has been used in these calculations.

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- 5.3 The additional equipment in the abatement plant system is likely to include two 3-way valves, two isolation valves and a small amount of electrical work. This should cost less than £1,000 in total.
- 5.4 Although exact figure have not yet been ascertained the maximum costs for installing both the circuit and plate heat exchanger should be of the order of £39,000.
- 5.5 The system to pump waste heat to the complex is a 15kW pump which costs £3,609.61 annually in electrical energy. Maintenance for one heat exchanger and one large pump set would likely cost around £800 per annum. The overall saving would therefore be in the order of £10,150.39 per annum.
- 5.6 The capital cost increase of the Crematorium system is estimated at less than £1,000 so the payback period is approximately 2 months. If the estimated capital costs of £39,000 for the additional heat delivery circuit to the leisure facility and the plate heat exchanger are added to this cost then the payback period is less than 6 years; and is certainly worthy of consideration.
- 5.7 The proposed system means that the current plan to install a CHP unit on site to heat the leisure centre would no longer be required, saving an initial £100,000 (the lifespan of a CHP unit is around 10 years maximum). Over the 25 year lifespan of the Abbey Stadium pool, not having a CHP unit therefore results in a capital saving of £261,000 and a maintenance revenue cost of £225,000. This system therefore compares very favourably with the proposed plan.
- 5.8 To conclude, the financial saving to the Authority by removing the CHP from the sports development and using the recovered waste heat from the mercury abatement process instead at the neighbouring crematorium would, over 25 years generate a cost saving to the residents of Redditch of £466,000, without even including the full energy saving costs over that timeframe.

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5.9 The 25 year savings are summarised in the following table (assuming today's fuel prices):

Costs over <b>25 years</b>	CHP unit	Waste heat technology	Saving
Capital cost	£300,000	£39,000	£261,000
Revenue cost	£225,000	£20,000	£205,000
<b>Total cost</b>	<b>£525,000</b>	<b>£59,000</b>	<b>£466,000</b>

Additional Gas cost*	£364,000	-	-
Electric cost	-	£90,225	-
Whole-life cost	£805,500*	£149,225	

\*Only the offset gas proportion is listed here, there will be significant natural gas costs even with the waste heat technology to supplement heating.

5.10. Based on these fuel costs the payback period for the waste heat technology is 4.05 years (£59,000/£14,560).

## **6. LEGAL IMPLICATIONS**

There may be a requirement to apply for a Bishops Faculty through the Church of England. There is currently no cemetery plan available to show if any of the cemetery has been designated as consecrated ground. A Faculty may be required if route which the insulated pipe work takes from the crematorium facility to the stadium project is to pass through any such areas. However, an alternative route outside the cemetery area is feasible.

## **7. POLICY IMPLICATIONS**

This work would assist in meeting the requirements of the climate change strategy and the air quality management strategy.

## **8. COUNCIL OBJECTIVES**

This will specifically meet with the key priority of being clean and green – Officers estimate this scheme will reduce the organisations corporate carbon footprint by around 4-5% by providing the ideal outlet for recycling of

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the waste heat energy recovered through the statutory requirement to reduce mercury emissions to air.

### **9. RISK MANAGEMENT INCLUDING HEALTH & SAFETY CONSIDERATIONS**

9.1 The main risk associated with this report is:

- Misunderstandings about the technologies leading to potential adverse publicity.

9.2 These risks are being managed as follows:

By the production of detailed communications plan that will include documentation explaining the process and full engagement with key stake holders and customers of the service.

9.3 Currently the risks identified in 9.1 are not addressed by any risk register and will be added to the Environmental Services Risk Register.

### **10. CUSTOMER IMPLICATIONS**

10.1 The Council is well aware of the sensitivities involved in Bereavement Services. It is important that the message which reaches customers is that although the heat is generated as part of the crematorium process, this heat is removed as part of the process to clean the flue gas and remove mercury. This heat is exhausted to the atmosphere in a totally independent system to the cremators and dissipated to the atmosphere through a separate route than the flue gases. The only difference is that instead of the heat being dissipated into the atmosphere, it is instead re-used in a way that benefits the community for this generation and those to come.

10.2 The significant increase of cremations undertaken in eco-friendly coffins is an indication of the general desire of many residents to limit their impact on the environment.

10.3 There is no direct contact between the cremator and the taking of heat from the flue gases in terms of the process of re-using the heat.

10.4 Reducing the costs of gas/energy can support limiting the cost of funeral services which can be a concern to many families.

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**11. EQUALITIES AND DIVERSITY IMPLICATIONS**

None identified.

**12. VALUE FOR MONEY IMPLICATIONS, PROCUREMENT AND ASSET  
MANAGEMENT**

12.1 Value for money implications are detailed within the Key issues. The cremator and associated ancillary equipment will be procured using an industry recognised OJEU framework agreement as advised by Redditch Borough Council procurement team, for the provision of one cremator, mercury abatement equipment and associated works at Redditch Crematorium.

12.2 It is anticipated that the contract will be awarded in the 1st Quarter of 2011 and its implementation will commence forthwith.

12.3 Although the heat recovery technology will form part of the procurement, it is envisaged that a separate procurement process will be required to connect the two projects. This pipe work circuit and connection contract will run parallel with both upgrades.

12.4 Asset management have been involved from the start of the cremator and buildings upgrade and will continue to provide essential support through the installation project.

**13. CLIMATE CHANGE, CARBON IMPLICATIONS AND BIODIVERSITY**

13.1 This work contributes significantly to the Council's objectives under the corporate priority of tackling climate change as it reduces our energy consumption and therefore our carbon footprint.

13.2 The reusing of waste heat, combined with reduced energy usage of the more efficient cremators together with energy recovery will significantly reduce the carbon footprint of both the Abbey Stadium and the Crematorium and will contribute to the Governments target of reducing carbon emissions by 80% of 1990 levels by 2050 under the Climate Change Act (2008).

**14. HUMAN RESOURCES IMPLICATIONS**

None identified.



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**15. GOVERNANCE/PERFORMANCE MANAGEMENT IMPLICATIONS**

None identified.

**16. COMMUNITY SAFETY IMPLICATIONS INCLUDING SECTION 17 OF  
CRIME AND DISORDER ACT 1998**

None identified

**17. HEALTH INEQUALITIES IMPLICATIONS**

None identified

**18. LESSONS LEARNT**

We are not aware of any other cremation authority in the United Kingdom using waste heat in specifically this way.

**19. COMMUNITY AND STAKEHOLDER ENGAGEMENT**

In addition to the communication plan and section 10, Members and Officers will be given briefing notes including FAQ. These guidance notes will be provided in association with technology providers and consultants, working on behalf of Redditch Borough Council. This will reduce the risk of any misinformation and will provide factual background for explaining and understanding the reasons and benefits of using the waste heat energy in this way.

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**20. OTHERS CONSULTED ON THE REPORT**

Portfolio Holders	Yes
Chief Executive	Yes
Executive Director (S151 Officer)	Yes
Executive Director – Leisure, Cultural, Environmental and Community Services	Yes
Executive Director – Planning & Regeneration, Regulatory and Housing Services	Yes
Director of Policy, Performance and Partnerships	Yes
Head of Service (GR/JG)	Yes
Head of Resources	No
Head of Legal, Equalities & Democratic Services	No
Project Development Manager (Abbey Stadium)	Yes
Corporate Procurement Team	No - but have been involved in procurement of cremation equipment

**21. WARDS AFFECTED**

All

**22. APPENDICES**

N/A

**23. BACKGROUND PAPERS**

N/A

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**24. KEY**

N/A

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