Clifton Scannell Emerson Associates

Report for Dun Laoghaire Rathdown County Council on Water Cremation/Resomation ®

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1 Introduction:

We were requested to report on Water Cremation/Resolution ® by Dun Laoghaire Rathdown County Council. Water Cremation/Resomation as an alternative to burial and cremations. The process uses water and alkaline hydrolysis under pressure. It is also is reported to be more environmentally friendly than Burial and Cremation.

In early 2017 under Part 8 of the Planning Laws, permission was granted for a new Crematorium and Service Buildings in Shanganagh Cemetery.

The offices of L.B.B.C. group in Leeds were visited by the author on the 19th September 2017 with Mr. Bob Hannon, Architect with D.L.R.C. We met Mr Sandy Sullivan and Mr Howard Pickard of L.B.B.C. Resolution Ltd. L.B.B.C. manufacturer the Resomation unit worldwide.

This report looks at the Water Cremation/Resomation process against the cremation system of body disposal.

2 Water Cremation/Resomation ®

Water cremation is a water based process with the addition alkaline hydrolysis. The system operates at temperature (300F) where body tissues are broken down through hydrolysis in an alkaline solution. The process was originally developed in 1888 in the US as a method to process animal carcasses.

The process has not been used for humans up until the last 10 years of so. The main area presently of activity for the system is in Canada and the U.S. In the US and Canada the system is called Bio-Cremation. The system manufacturer in Europe is Resomation Ltd. In the UK. Resomation is a registered trade mark and system owned by LBBC Resolution in the U.K.

The process has the body being placed in a special cotton shroud within a coffin at the time of death. The initial funeral service is as per the normal family wishes. The coffin is then taken to the Resomation unit after the service. All similar to a cremation. The coffin has a side door to access the body and is therefore reusable up to 30 times. The body is then removed from the coffin in the shroud and placed in the Resomation unit.

The body is placed in the Resomation pressure vessel which is then filled with a solution of water and the alkaline hydroxide. The process is fully automated where the body in initially weighted so as to supply the correct amount of water and solution of alkaline hydroxide. At this point the liquid is highly alkaline with a PH of 14. The pressure vessel is then heated up to 300ºF and put under pressure until the body tissues have dissolved leaving only the bones of the body. The contents are then cooled down and the bones are rinsed with water. The residual water has a PH level of 11 at this point. The liquid solution has acid added to reduce the PH down to 7 which is neutral. The liquid is then pumped into the public sewer system. The discharge liquid contains salts, sugars, amino Acids and peptides, all from the body. The total water used in the process is of the order of 1500/2000 l. per burial. When the body has embalming fluid used additional chemicals and water may be required in the process.

The remaining bones are removed from the unit. The bones are initially dried and then placed in the cremulator. This part of the process is similar to the cremation process whereby the bones are ground to a dust and finally put in an urn. Metal implants are also removed at this stage. The total time including the drying process can take 5 hours. Two full processes can therefore take place in a normal day.

Mercury removal from the body is by a manual process where the teeth with mercury are removed by hand prior to the cremulation process. Teeth with gold and silver are also removed in a similar way. These teeth are stored and removed at certain times throughout the year for processing.

Presently the only operational units of Water Cremation/Resomation are in Canada and the US. In Canada Saskatchewan, Quebec and Ontario have legalised the process. In the US 14 states have legalised the system. California we understand are about to legalise it. New Hampshire is the only state to prohibit it.

There is a unit under construction for Sandwell Council (UK) at Rowley Regis Crematorium. It is proposed to be operational in the first quarter of 2018. The unit for this facility is presently under construction at the work shop of LBBC Resomation .

3 Energy Usage:

Gas usage for cremations varies from the number of cremations and the day it is used (pre-heating). Electricity figures are for full mercury abatement. Based on 5 day week with 5 cremations per day the main gas energy usage for cremation is:

a) Gas - 26.7m3 (23.7m3 for 6 cremations per day)
b) Electricity – 15.9kw (Single System)
c) Water – 0

The Main utility usage for Resomation is:

a) Gas - 12 m3
b) Electricity – 11kw
c) Water – 1500 to 2000 litres of potable water.

As can be seen the gas the usage is considerable below a typical cremation. Electricity figures are higher for cremations. Water is the only other utility required for Resomation.

4 Environmental:

We are in receipt of 2 reports dated 2011 and 2014 on Resomation. The report were funded by YARDEN which is a Dutch company that has 41 funeral homes, 22 crematorium and 7 cemeteries.

The 2011 report looked at 4 systems that dispose of bodies after death.

1) Burial
2) Cremation
3) Cryomation
4) Resomation

The report is based on the Dutch approach to the Burial/ cremations. Resomation at the time of that report was not legalised in The Netherlands. The report included Cryomation (freezing of the body) which to date has no units operational. The report uses environmental impacts at all stages of the burial process based on life cycle technologies, and it uses a shadow price per deceased in euro's.

1) **Burial** – in the Netherlands you only rent the grave plot for 10 years and after that the body is dug up and reinterred to a mass grave. The headstone is also removed and disposed of. There is also a note regarding the stone for the headstone being imported due to lack of stone quarries in The Netherlands and this added to the economic cost.

2) **Cremations** – Cremations carried out are to a similar process in Ireland. There is a difference with the disposal of the ashes though. There appears to be a high percentage of spreading the ashes on land and at sea. In Ireland a percentage of 25% approximately is where the ashes are not buried in a grave, or in a columbarium. They are either scattered or in the possession of the family.

3) **Cryomation** - Information on the Cryomation and process was received from Cryomation Ltd. We are aware that for the Cryomation process that 1000l of potable water is used and this was not considered in the calculation. This water is disposed of into the public system. Presently there are no Cryomation units operational to verify figures.

4) **Resomation** - Information on Resomation at the time was received from Resomation Ltd. For the Resolution process up to 2000L of portable water is used and discharged into the public system. Also this water usage is not considered in the calculation.

The 2014 Report only assesses burial, Cremation and Resomation. The report is an updating of the 2011 report and it excludes Cryomation. The report uses the same environmental impacts at all stages based on life cycle technologies, and it uses a shadow price per deceased. The funeral techniques are based on Dutch traditions as previous.

Burial:

The overall shadow price for burials (from 2011 to 2014) drops from €85.28 to €50.77. Within these figures the timber coffin price drops. The lining for the coffin jumps from €11.11 to €21.4. Occupation of land drops from €37.69 to €12.83. The technique of reburied appears to be the same, but the shadow price has come down considerably. The overall practice of burials in Holland is different in Ireland.

Cremation:

The shadow price for cremation has gone up from €32.33 to €45.15. Major changes include the coffin lining going from €11.11 to €21.34. The lining in the coffin is now 47% of the total. Flue cleansing emissions have gone from €5.17 to €19.2. Again the technique did not change but the price from 2011 to 2014 changed considerably.

Resomation:

It was noted that further information on the resolution process was received due to the opening of 3no. units in the US. The overall shadow price total fell from €5.79 to €2.83. The process cost changed marginally (€11.43 - €11.82). Lining went from €2.47 to €4.73. Total stainless steel went from €2.51 to € 0.28. The water usage and disposal of in the Resomation process (1500 – 2000L) is again disregarded in the calculation. Also the disposal cost of the ashes as against cremation are considerably different with cremation. We would consider that this should be the same! Prices for recycling metals also differs with cremation?

Detail of pricing figures in attached spread sheet.

Conclusions:

The burial process showed a dramatic reduction in environmental costs between 2011 and 2014. The Irish experience would reduce the cost further as there can be up to 4 burials per plot. Also there would not be any reburials.

Cremations prices have also changed upwards primarily due to the coffins liner. In parts of the US the coffin is rented and the body only is cremated. This is possible, except it increases the time of cremation and the amount of gas used. Irish practice uses the coffin as fuel whereby the gas is used for the first 20 minutes to ignite the coffin. After that the air is blown into the unit and this is what cremates the body. This reduces considerably the overall gas usage.

The Resomation figures are from the industry and have yet to be independently verified. The calculation assumes all heavy metals are reused and at a higher level than cremation! Water usage is also not considered in the calculation. This is even though the price for the coffin liner went up due to the large usage of water in making the liner. This water usage is not calculated in the Resomation figures.

5 Religious Sentiment:

To date the Catholic Church in New York have come out against Water Cremation/Resolution.
We are unaware of any other religious comments.

6 Effluent Disposal:

The water discharge from the Resomation system would be considered as effluent. Quoted average figures by Resomation are 20,000 mg/l COD, 13,000 mg/l BOD, 2500 mg/l TSS and up to 5000 mg/l FOG. Heavy metals discharged are stated to be below authority limits. These figures would indicate very poor water quality and would require treatment. As the unit in Sandwell Council in not operational independent figures are not available. The figures quoted are not exceptional and can be treatable with a modern treatment plant.

- Definitions: C.O.D – Chemical Oxygen Demand expressed in parts per million. COD in the amount of oxygen required by chemicals in water that can be oxidised.
- B.O.D. – Biological Oxygen Demand expressed in parts per million. BOD refers to the amount of oxygen required by microorganisms in the oxidation of organic matter.
- T.S.S. – Total Suspended Solid.in expressed in parts per million. TSS refers to the small solid particles that remain in suspension in water. It is one of the figures in the quality of water.

As part of the environmental report by Yarden, metals were assumed to be reused, yet the effluent liquid are assumed to have low levels of heavy metals. Mercury, gold and silver that are in tooth fillings are removed manually as there are no other methods of removing heavy metals.

7 Legal

Presently in the U.S. and Canada only a number of States allow Resomation. In the Netherlands, as per the Environmental Report the process remains illegal.

In the U.K. the Scottish Law has been changed to allow Resomation. In England there is an ambiguity whereby it does not forbid Resomation but does not mention it. We note the first Resomation Unit under construction in Sandwell Council area near Birmingham.

8 Shanganagh Site

In the event of the Resomation process being installed in the new Crematorium building the unit would fit into the building. The services required would be Gas (with a flue), electricity and water. Due to the process a full gravity foul sewer system is required. Gas, electricity and water are to be supplied to the site.

Due to the location of the site the foul sewer system presently proposed is to be treated on site. The additional volume from the Resomation process would add considerably to the load and the proposed system. Presently the Resomation system is therefore premature from the foul sewer point of view. It is envisaged that within 5 years the site will have mains drainage.

From a financial point of view the Resomation unit is reported by the manufacturer to be a similar price to a cremation unit. With the additional water usage the mains supply pressure for the site should be checked.

9 Conclusions

- The Gas and Electricity usage for Water Cremation / Resomation is less that cremation (46% less).
- The environmental impact of the constructed building to house the cremation and Resomation units was not considered. The figure should be the same for both. This would raise the price of Cremations and Resomation against the normal burial process.
- Water usage and disposal is not taken into any calculation for Resomation. Yet the impact of the water usage in the lining for the coffins is taken for in cremations.
- The price for alkaline hydrolysis in the Resomation process in not considered in the Yarden reports.
- The environmental impact of the coffin in the cremation process is considerably more than the reused coffin in the Resomation process. The liner material in the coffin for cremation is higher due to high water used to produce the material.
- The environmental impact of the Mercury filters and the flue maintenance in the cremation process is considerably more than the Resomation process.
- The pricing for the Resomation process in the 2014 Yarden report has come from Resomation Ltd. We would recommend independent figures when the Sandwell unit is operational.
- The Resomation process requires a foul sewer mains connection that is presently not available for the building at the proposed Shanganagh development.

- Resomation can facilitate 2 processes in a normal day. Cremation can handle 6 processes in a day. As the unit price for both cremation and Resomation units are comparable the repayment of the capital outlay would be longer for Resomation.

- The recycling figures for heavy metals by Resomation are greater than for cremation as the mercury, gold and silver are removed manually (from teeth). For cremation the heavy metals are removed by the filtration system.

- The Resomation process may be more environmentally efficient with lower gas and electricity usage and the use of a reusable coffin reduces the environmental impact over that of cremations. The use of water and its discharge however should be considered in the calculation for Resomation. It is noted that the environmental cost of the coffin liner in cremations was increased due to the water used in its production. The environmental advantage of Resomation over Cremation is largely in the process. However other environmental considerations also require to be factored in. In this respect the environmental cost of the building that houses the Resomation and Cremation units should be considered against that of normal burials together with the significant environmental cost related to how many and how far people travel to the funeral service. This figure as noted in the Yarden report may be considerably more than the benefits related to the Resomation process itself and is highly variable. As a consequence it is considered that the exact environmental cost of Resomation requires further clarification and checking.

- In the two Yarden reports in 2011 and 2014 it is noted that Resomation has not been legalised in the Netherlands. We are not aware that the process is legal in 2018.

- Resomation would require a marketing exercise to promote the process due to the issue of the water discharge and its contents. It is considered that the system may be up and running in the UK and other European countries in a few years. Dun Laoghaire Rathdown County Council would have to test market reaction before bringing in the process at Shanganagh. A number of operational units in the UK and independent environmental figures may assist in this regard in the future.

- The required mains foul mains system for Shanganagh is currently not available.

- Since our visit to the manufacturers we tried to contact the Water authority for the proposed Resomation in Sandwell (UK) without success. In the last 4 months we have learnt that the local Water Authority for Sandwell has refused permission for the unit to discharge its water into the public main. The question is to what is being discharged. The local authority's application for a "trade effluent permit" was refused because there was no water industry standard regulating the disposal of liquefied human remains into sewers.

It is considered that adopting the Water Cremation / Resomation process for the proposed facility at Shanganagh is consequently very premature. More data is required from Resomation units in operation and in particular where burial processes are similar to Ireland (UK).

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20th June 2018

Appendix: Shadow price figures from Yarden 2011 and 2014 reports.

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