The Silver Bullet: Redefining waste as resource in the NHS

Simon Hundal
About The Stephen Betts Group

- Established in 1760 and run by the ninth consecutive generation of Betts family management, making it one of the oldest family owned and managed businesses in the UK
- British group of businesses all associated with precious metals, including dental alloy manufacture, refining, jewellery manufacture and recovering precious metals from waste
- One of the best known and trusted names in the precious metals industry
- Ethos of innovation in the recovery of precious metals

Alexander Betts
(Business Founder, 1760)
About Betts Envirometal

• Fully licensed & accredited waste management division of the Stephen Betts Group
• Recycling-driven strategy
• Specialising in:
  – Processing precious metal bearing wastes
  – Environmental compliance
  – Confidential storage and destruction of records & X-rays
  – Integrated waste management solutions
Properties and applications of Silver

- A soft, white, lustrous precious metal with a market value of around £500 per KG in its pure form
- Long valued as a precious metal in jewellery, tableware, ornaments and investment
- Unique physical properties lead to a great number of industrial and scientific uses:
  - Highest electrical conductivity of any metal
  - Highest thermal conductivity of any metal
  - Lowest contact resistance of any metal
  - Ductile and malleable
  - Natural oligodynamic effect (for antibiotic/antimicrobial applications)
### Silver in the NHS

#### Medical X-ray Film:
Silver halide X-rays provide extremely accurate images and were the standard for many years. Digital technology is now increasingly prevalent, but most trusts have large archives of silver-bearing X-ray film.

#### Anti-bacterial dressings:
The oligodynamic effect of silver means that silver ions prevent bacterial growth and speed healing time, whilst being non-toxic to humans. Last year, the NHS spent £26m on silver-bearing wound dressings.

#### Nanotechnology:
Silver nanoparticles can be used to sterilise up to 650 types of bacteria. Colloidal nanosilver is used for its antimicrobial properties in a huge range of applications, including air conditioners, air purifiers and pigments.
Silver in the NHS (cont.)

Electronics:
Hospitals utilise a huge amount of electronic equipment, almost all of which is configured with silver, due to its excellent electrical conductivity

Dental:
Due to its physical properties, silver is a key constituent element in dental amalgam, as well as in several other dental alloys used in crown and bridge restorations

Instrument coatings:
Again due to its antibiotic properties, silver is often used as a fine coating on surgical instruments, catheters and breathing tubes, where it reduces the risk of ventilator-associated pneumonia
Silver in the NHS (cont.)

**Water purification:**
Silver ions are added to water purification systems in many hospitals, as the catalytic action of silver and oxygen sanitizes the water and prevents the build up of bacteria and algae.

**Silver oxide batteries:**
Silver oxide batteries are used in hearing aids due to their long life and high energy-to-weight ratio. High capacity silver-zinc and silver-cadmium batteries are also increasingly utilised.
Current Scenario – Silver as a waste stream

- Over 500,000 tons of waste is either incinerated or sent to landfill each year by the NHS
- Standard waste management firms do not have the specialist equipment needed to recycle silver bearing products, so this valuable material is generally disposed of alongside general and hazardous wastes from hospitals
- Disposal of this waste increases the NHS’ carbon footprint and is extremely costly (sometimes up to £1000/t for clinical/hazardous waste)
- Sensitive data is regularly shipped overseas by third party contractors for recycling in India or China with no clear audit trail
Silver recovery brings multiple savings

- Yet many of these waste streams could potentially generate a rebate for the NHS, or at least be cost neutral

- For example, when Betts Envirometal collected 40 tonnes of X-ray film from a London hospital, the hospital received in the region of £20,000 rebate

- In the past, that material would have been left in deep storage, shredded and buried, or incinerated

- Removing the film for destruction not only resulted in a significant financial gain, it also brought a cost saving in storage fees and impacted positively on the carbon footprint of the facility
### X-ray film as a waste stream

- X-ray film should, according to NHS retention legislation, be retained for 8 years (or 21 years for cancer/pediatric X-rays).
- After this period, trusts retaining film are in breach of the law (although many trusts do have large archives of older film).
- Most trusts pay storage companies to store film offsite for the required retention period (or beyond) and then pay considerable ‘exit’ fees to remove this film for destruction.
- This film is then traditionally destroyed by one of three methods, all of which incur further costs for the trust:
  1. Incineration, with its associated carbon footprint
  2. Recycling overseas, with data protection issues
  3. Landfill, with considerable environmental impact
X-ray film as a resource

- The silver content of medical X-ray film actually means that none of these routes are necessary.
- It is possible to retain this waste stream within the UK, ensure the protection of sensitive data, avoid incineration or landfill, and recycle every constituent element.
- By releasing the value of the silver in this waste stream, trusts can cover the cost of processing the waste as well as potentially reducing storage costs and even generating a significant financial rebate.
Silver recovery process for X-ray film

- **Collection**
- **Sorting**
- **Stripping**
- **Granulation**
- **Reversal**
- **Agitation**
- **Silver Recovery**
- **Refining**

- ADR-licensed vehicles required for collection of X-ray film
- CRB-checked staff sort film and any files not ready for destruction are securely stored
- Cardboard sleeves & paper records are removed, shredded to EN15713 & recycled
- Film for destruction is granulated to maximise surface area
- Ferric Chloride bath returns film to its unexposed state (ie Silver Chloride)
- Film is agitated in sodium thiosulfate, removing silver from film and into solution
- Silver is electroplated out of sodium thiosulphate solution, PET is recycled
- Silver is then smelted, refined and recycled into a range of products
Case Study – Doncaster Royal Infirmary

- DRI was one of the first health organisations to appoint a dedicated Waste Manager responsible for minimising waste and ensuring legal compliance

- Aware of its legal obligations regarding X-ray film which had reached the end of its retention period, it contracted Betts Envirometal:
  - All materials were processed at Worcestershire facility and 100% recycled meeting DRI’s Carbon Management Strategy
  - All compliance documentation, certificate of destruction and destruction reports were provided by Betts Envirometal, ensuring legal compliance for DRI
  - Significant financial rebate was paid to DRI for the value of the silver recovered, turning what had previously been a costly waste stream into a valuable resource
Conclusions – Key questions for NHS facilities managers

• Does your Waste Management contractor have a policy for precious metal bearing wastes, or are they simply treated as hazardous wastes?

• Will precious metal wastes be recycled in the UK, avoiding sending valuable resources overseas?

• Is the most environmentally friendly solution for disposing of precious metal wastes being employed?

• Does your contractor have the required security and services standards to ensure precious metal bearing or confidential wastes are being processed in compliance with the data protection act? (ISO 27001, ISO 9001, ISO 14001, Shredding Standard EN15713, Data Protection Registration)

• Could your trust be making a significant financial saving by recovering precious metals from waste streams?
Contact

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