In October, 2014 the Canadian Trade Commissioner Service and the High Commission of Canada in London announced the 2nd Canada Innovation Competition concluding in March 2015 at Ecobuild in London. The competition aimed to find new and innovative products/services from Canada to meet current and emerging challenges in the UK green building and sustainable design sector.

The Competition is run in collaboration with the Canada Green Building Council and the Canada UK Sustainable Building Network. In the UK this is supported by Innovate UK the UK Government’s innovation agency working in the Built Environment.

The shortlist and winner was selected by a panel of judges against criteria including key UK themes, innovation, suitability for the UK market and opportunity for success. The shortlist of six companies was announced on February 2nd and the winner – Cadillac Coatings Inc. – was announced on February 26th.

This case study has been developed for the winning entry as part of the competition prize.

Visit www.cuksbn.org/innovation for more information.

Canada Innovation Competition 2015 – Winner:

Cadillac Coatings Canada Inc.
8918 - 18 Street
Edmonton,
Alberta
T6P 1K6

The drive to energy efficiency, sustainability of materials and reduction in whole life cost of buildings has led to an increasing amount of innovation in materials and products for the construction industry.

With these requirements in mind Cadillac Coatings Canada Inc. have developed a patented process for factory powder coating non-conductive substrates, coating a diverse range of products including:

- Slate and stone veneer / tiles,
- Medium density fibreboard (MDF),
- Wood composite,
- Oriented strand board (OSB),
- High density fibreboard (HDF),
- Other composite paneling,
- Magnesium board (MGO),
- Cement board, and
- Other non-metallic and non-conductive materials.

The benefits of powder coating are well known in certain parts of the market and it is recognised as the finish of choice for conductive materials where an anti-weathering, anti-corrosion, anti-abrasion, flexible, formable, oil, chemical, solvent and stain resistant finish are required. These benefits are now available to the non-conductive materials market with the potential to open up a substantial field of new architectural design freedom to building specifiers whilst meeting not only environmental objectives but durability and maintenance issues as well.

What is it

This process is an advanced method of applying a decorative and protective finish. The powder used for the process is a mixture of finely ground particles of pigment and resin, which is sprayed onto a surface to be coated. The electrostatically charged powder particles adhere to the surfaces until they are heated and fuse into a smooth coating in a curing oven. The result is a uniform, durable, high quality finish that is known as powder coating.

The efficient advanced production line at the Cadillac Coatings facility in Alberta is capable of producing up to 8 m of finished product per minute with a focus economic excellence of finish and meeting environmental objectives.

Providing a colour finish in any standard RAL or Pantone colour decks with smooth micro, metallic and textured finishes for interior or exterior applications, the company will also provide a colour matching service and base material testing to ensure suitability for any project - all backed up by a 15 year warranty.
The UK Market

The UK coatings industry interacts with multiple markets providing employment to over 300,000 people and is valued at £188 billion\(^1\). This product ideally fits within the £18 billion, building completion & finishing sector and takes market share from both the industrial coatings and painting and decoration components.

The drive for advanced coatings techniques led the Technology Strategy Board to set up the Surface Engineering and Advanced Coatings Special Interest Group (SEAC SIG) to identify where investment can help UK manufacturing to realise the market opportunities opened up by the application of SEAC. A June 2014 report\(^2\) by this group indicates that there is a growing market for engineered paints including powder coating techniques.

As the range of materials coated expands there is a substantial opportunity to provide a disruptive effect on the traditional site coated product market. The speed of coating application, the durability of the finish and environmental performance of the process has all the credentials to meet drivers within this market. The Market however has little awareness of the benefits of this coating process and range of materials suitable for coating or indeed who does it, lead in times and cost/benefit against traditional methods.

Barriers to Market Entry

Product Specific

- Lack of market awareness in the technology
- Lack of awareness in the product range and types of material that can be coated
- Lack of awareness in the suitability for projects and fit for purpose
- It is a new product offering without an existing supply chain
- The product has not been tested to recognised British/European harmonised standards

Company Specific

- The company is not recognised in the UK and has no existing supply chain.
- Limited understanding of the UK market
- Import/Export knowledge
- Lead-in times

Cadillac Coatings Canada Inc. is a Canadian based company providing a product that requires application at their site in Canada, this restricts the product offering in the UK market to:

- Base products that are manufactured and coated in Canada and transported to the UK
- Base products that are manufactured in the UK and transported to Canada for coating in Canada with a return trip

Both options provide for an additional cost that should form the basis of a cost benefit and whole life cost analysis, to provide potential customers in the UK with a guide as to the cost viability of the product against UK supplied and site coated alternative. The whole life cost should include for the reduction in maintenance and value of product guarantee.

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\(^1\) http://www.coatings.org.uk/Statistics/Industry_Statistics_public.aspx

Suitability of the Product for UK Market

The coatings process is directly applicable for the UK Market in terms of both the product range and the way the market procures this product type.

There is a need for a new way of delivering construction due to a recognised skills gap\(^3\) in trades, offsite manufacture of component is becoming more commonplace and meets both the skills shortages and sustainability agenda.

The coating process would allow the use of locally grown and manufactured products, providing them with a durable cost effective coating in a multitude of finishes and colour ranges with the added security of a warranty on coating performance.

Direct Competitors

There are competitors in the UK market although initial investigations suggest a limited product range and a high application onto MDF in the furniture and cabinet industry such as:

- OXYPlast UK\(^4\) Nuvo coat is recommended for use on wood and engineer products
- MDF Coaters\(^5\) specialising in an extensive range of powder coating to Medium Density Fibreboard (MDF)

Expanded product ranges into cladding and other composite boards are generally not available.

Market Penetration Opportunities

Opportunities to enter the market include:

- Direct sales into UK market – this option requires access to the supply chain, marketing and a UK presence.
- Collaboration with existing suppliers of Canadian base products to UK market. This would have benefit of an existing supply chain and the cost of transport is already factored into the existing supply.
  - Canadian suppliers to UK market:
    - Vincent Timber – [http://www.vincenttimber.co.uk](http://www.vincenttimber.co.uk)
    - Fraser Timber Cladding – [http://www.frasertimbercladding.co.uk/](http://www.frasertimbercladding.co.uk/)
- Collaboration with UK based base product suppliers – this would require sourcing suppliers and roundtrip shipping but into an existing supply chain.
- Licensing of product process to UK suppliers – providing knowledge, technical guidance and product expertise.
  - Paint and coatings directory
  - Cladding and timber products
    - [http://www.timbercladding.org/Sources.aspx](http://www.timbercladding.org/Sources.aspx)
    - [https://www.trada.co.uk/dir](https://www.trada.co.uk/dir)
    - [http://www.wpif.org.uk/Members.asp](http://www.wpif.org.uk/Members.asp)

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\(^3\) Construction, Building Services Engineering and Planning: Sector Skills Assessment 2012 (CBSE&P),

\(^4\) [http://www.oxyplastuk.com/oxyplast-products](http://www.oxyplastuk.com/oxyplast-products)

\(^5\) [http://www.mdfcoaters.co.uk/](http://www.mdfcoaters.co.uk/)
Sustainability Credentials

The powder coating process contains no VOCs (volatile organic compounds) no solvents, no off gasing, no HAPs (hazardous air pollutants), produces no hazardous materials and can be can be incorporated for health conscious surfaces. Coupled with minimal wastage and recycling of overspray on site.

Additionally this coating process provides a more uniform, durable finish and extends the interval between recoating improving the whole life performance and cost when compared against traditionally site coated materials and it allows the reduction of environmental impact through the use of more sustainable materials and processes.

Powder coating when used to coat interior wood based products offers tremendous savings in processing times delivering an uncoated board product to a coated product that can be packed and shipped in as little as one or two minutes, a fraction of the processing time for conventional spray applied coatings.

There is a drive within the UK market for this type of product, both in terms of environmental performance and product variation. This method of powder coating non-conductive materials meets both objectives allowing the use of natural renewable materials as a base and providing them with a durable protective coat requiring less whole life maintenance that typical site applied finishes. The scope of the product range provides both internal and external applications with the potential for throwing recycled base materials into the mix further enhancing environmental performance and expanding the potential product ranges.

Carbon Footprint

- UV-curable powder coatings have the lowest environmental impact of coating materials
- Reduced waste in production
- Easy waste recycling
- Can process more materials in a shorter period of time
- Carbon footprint up to 10 times less than solvent borne spray applied coatings

<table>
<thead>
<tr>
<th></th>
<th>Solvent borne – 2K</th>
<th>Water borne - UV</th>
<th>UV Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide, CO₂ (kg/m²)</td>
<td>0.96 / mil of coating5 mils</td>
<td>0.35 / mil of coating</td>
<td>0.21 / mil of coating</td>
</tr>
<tr>
<td>Typical coating thickness</td>
<td>5 mils</td>
<td>2 mils</td>
<td>2 Mils</td>
</tr>
<tr>
<td>Coating Carbon Footprint (CO₂)</td>
<td>4.8 kg/m²</td>
<td>0.7 kg/m²</td>
<td>0.41 kg/m²</td>
</tr>
</tbody>
</table>

Figure 8: Coating technology impact on carbon footprint

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6 http://www.uncg.edu/che/about/presentations/UV%20Curable%20Powder%20Coatings%20-%20Andrew%20Walton.pdf
Volatile Organic Compounds (VOCs)

There is legislation in place to limit the amount of Volatile organic compounds within finishes in the UK based on EU directive 2004/42/EC which all European Union member states comply with. It covers coatings applied to buildings, their trim and fittings, and associated structures when applied for decorative, functional and protective purposes and in includes imported products. The British Coatings Federation (BCF) has been successful in having most powder coating manufacture removed from legislative control, they argued that controlling the manufacture of powder coatings was unnecessary as they do not contain VOCs. This provides a substantial benefit in terms of environmental performance and meeting not only legislative compliance but also designers and specifiers sustainability objectives.

Depending on the application and whether BREEAM standards are to be met testing may still be required against BS EN ISO 11890-2:2013 Part 2.

Sustainability Standards in the UK Market

There is great importance placed on sustainability credentials through building environmental performance standards. Within the North American market LEED is the front runner in terms of volume, in the UK this is BREEAM.

BREEAM is the Building Research Establishment Environmental Assessment Method for buildings. It sets the standard for best practice in the UK and worldwide for sustainable design and construction and is widely used to describe a building's environmental performance.

The Cadillac Coating Canada Inc. powder coat finish can help to contribute towards BREEAM 'credits', which reward design measures in the following areas:

- **Credit name: Hea02 Indoor Air Quality** - This credit rewards buildings where finishing products have met testing requirements and emissions levels for Volatile Organic Compound (VOC) emissions against the relevant standards.

  One of the key sustainable features of the Cadillac Coating Coatings Canada Inc. process is the absence of VOCs. The powder coating contains no off-gases, no solvents, no HAPs (hazardous air pollutants) and produces no hazardous materials. This is of particular benefit in interior applications for BREEAM assessments, where points are awarded for finishing products that can demonstrate the lack of VOCs through testing (EU Directive 2004/42/CE and BS EN ISO 11890-2:2013 Part 2).

- **Credit name: Mat06 Material Efficiency** - This credit rewards measures to optimise material efficiency in order to minimise environmental impact of material use and waste, in particular through design and construction measures such as off-site manufacture and the use of pre-assembled components. Powder coating is a process that takes place wholly off-site, with no touch-ups or refinishing required at the site location. Transporting powder coated materials is very efficient as everything that is carried is used, unlike liquid coatings where there is inevitable wastage. Optimising material use is a key resource efficiency goal for any sustainability strategy; the use of powder coating helps to ensure efficient use of materials, prevent waste and reduce depletion of natural resources. From a lifecycle costing perspective, the product is less expensive than traditional methods and will help reduce maintenance costs over the lifetime of the building.

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- **Credit name: Man03 Responsible Construction Practices** - This credit recognises and encourages construction sites which are managed in an environmentally and socially considerate, responsible and accountable manner. The Cadillac Coating Canada Inc. process helps to avoid the use of environmentally hazardous substances at the site location, where there is increased risk of pollution to air, ground and water sources through the use of solvent based dispersants or paint spillages.

- **Credit name: Mat05 Designing for Durability and Resilience** - This credit rewards the protection of exposed elements of the building, therefore minimising the frequency of replacement and maximising materials optimisation.

  Cadillac Coatings Canada Inc. helps to protect coated building components from impact, abrasion, and light and temperature exposure, being suitable for external use. The product comes with a 15 year limited warranty in support of this.

**British Building Product Performance Standards**

The UK is a heavily standardised market with numerous standards required to validate the fit for purpose and performance of this product category. The standards can be split into 3 main areas of:

- **Safety**
- **Testing and adhesion**
- **Durability of the finished product**

### Safety

- BS EN ISO 8130-1 to 14:2010. Coating powders. Various parts determining requirements for powders used for powder coating

### Testing and Adhesion


### Durability

- BS EN ISO 4628-8:2012. Paints and varnishes. Evaluation of degradation of coatings. Designation of quantity and size of defects, and of intensity of uniform changes in appearance. Assessment of degree of delamination and corrosion around a scribe or other artificial defect
- BS EN 927-6:2006. Paints and varnishes. Coating materials and coating systems for exterior wood. Exposure of wood coatings to artificial weathering using fluorescent UV lamps and water
- BS EN ISO 15110:2013. Paints and varnishes. Artificial weathering including acidic deposition
Additionally, Section B4 of the UK Building Regulations sets out the requirements for spread of flame application to external cladding.

As with ASTM standards for the North American market, specifiers will expect to see compliance with the relevant UK standards to validate the products suitability and viability for use. The cost of meeting the required standards may prove prohibitive and time consuming, preventing a cost effective and quick entry to market.

Next Steps

It’s clear that Cadillac Coatings provides an innovative element that would meet UK requirements for sustainability and effect a whole life cost and performance enhancement against site based coatings. To interact with the market the manufacturer will need to show compliance with the relevant UK standards for BREEAM, powder coating proprietary finishes, and undertake an evaluation of life costs against a framework of on-site coated equivalents in the UK market.

The nature of the coating process requires either:

- Investment in appropriate plant and/or licensing the technology to existing providers in the UK market
- Cross Atlantic shipping of the base product for coating in Canada and shipping to the UK/EU market with the associate shipping costs, this may present a less cost effective offering and should be the basis of a detailed cost model.

The key objective should be to seek technically competent partners to deliver the patented process to the UK and European markets under license, providing back up services in:

- Plant set up, control and maintenance
- Coating specification
- Technical resource
- Compliance and quality control.

Also, in the timber and cladding market there are numerous suppliers to the UK from Canada and investigations should focus on the added value this innovative powder coating process can bring to the existing Canada to UK supply chains.

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