CGI International Limited
A company transformed through engaging in KTPs

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Abstract

CGI was an SME, like many, that was strongly sales driven and gradually losing its skilled technical staff with no up and coming new blood to replace them. The robust scientific/technical knowledge as to how and why the product performs in a fire situation was almost non-existent in the company, where the formulations were empirically based and relied on trial and error to achieve given properties, a very cumbersome process. This severely restricted the company's ability to develop new products that would ensure growth in the future, leaving them vulnerable to those competitors, large multi-nationals, who were in a better position to introduce superior products thus adversely affect CGI’s sales, maybe even put them out of business.

Over a period of 6 years CGI embarked on a series of KTP projects addressing different parts of the business transforming it into a world class manufacturer of high quality fire safety glass. Not only are they now competing competitively with other suppliers but introducing new glass formulations unique to the industry offering much higher specification than was previously available.

1. Background

CGI International Limited (CGI) is a SME with a manufacturing operation in Haydock producing fire safety glasses. The company was established in 1998 following a management buy-out from Colebrand Group. Prior to the initial contacts with the University of Leeds they were a sales focussed company with one product – Pyroguard EW Fire Resisting Glass – which is either 2 or 3 sheets of a float glass sandwich filled with a polymer resin – certified to resist fire breakthrough for 30 or 60 minutes. The resin formulation was complex, had been developed by external consultants 15 years previously and this knowledge had left the business. CGI is an SME competing with large multi-nationals, e.g. St Gobain, Asahi-Pilkington for sales into the construction industry in Europe but Pyroguard EW is a product with a unique selling point, its cuttability, which means it can be produced in large sheets and cut to size on site.

In 2007 there was a developing market in Construction industry, UK and Europe, but CGI was under severe pressure from much larger competitors, more stringent performance requirements coming from the industry, and from Architects requiring larger tested sizes than could be produced by them.
What was required for CGI to continue in business? They needed:

- to establish a product R&D route and facilities
- to understand the polymer chemistry underpinning the product
- to understand and resolve chemical formulation issues
- technical expertise to handle customer complaints effectively
- to establish a product line with enhanced, market leading performance
- to improve the manufacturing line to produce revised product

2. Solution – KTP

A possible solution to these needs was to work collaboratively with a leading University with the appropriate knowledge. Following detailed scoping discussions with the KTP Office and Academics at Leeds a 3 year KTP was approved for funding to:

‘Understand and map the polymer chemistry of fire resisting glasses and use this knowledge to enhance their performance and to develop new products’

The Academics involved were from two different Schools; Dr Roth Phylaktou (Fire & Explosions) and Prof. Jim Guthrie (Chemistry). An Associate was recruited, at second attempt, in 2007 – Dr Vince Crook. Everything started well and then in 2008/9 the CGI world began to change dramatically;

- Chairman and MD retired – replaced by a new Chairman who was based in France (04/08)
- The Sales Manager, who was the initiator of the KTP, became General Manager (04/08)
- A new Sales Manager joined (05/08) and the General Manager left (11/08)
- Production Manager and Factory Manager left (03/09)
- Financial Director left (04/09) and a new Managing & Financial Director joined (05/09)
- At the same time the recession hit and the Construction industry market in Europe virtually collapsed.
- Production capacity was rationalised to reduce costs and staff made redundant

All of these factors could have resulted in an early finish for the project, however through this period the company philosophy and strategy was changed, as follows, by the management board thereby reinforcing the strategic need for the KTP.

‘CGI are to be regarded in future by the outside world as a technically led company selling innovative solutions to the fire engineering problems faced by the construction industry’
The KTP continued through to a successful conclusion with the following outcomes:

- Chemistry and performance characteristics of Pyroguard EW was well understood
- Improved product consistency was achieved
- New market leading variants of the product were introduced having
- Enhanced impact resistance resulting in sales gains in Holland
- Certificated fire resistance in significantly larger sizes = 10% increase in sales in Holland
- New on-site R&D facility was established
- The Associate recruited as Head of R&D in CGI to lead a 3 year technical development plan
- CGI were very well positioned to take advantage of the market upturn post recession
- Twelve undergraduate and postgraduate student projects were carried out including postgraduate student placements in CGI
- Joint papers and publicity were produced
- Two further KTPs were proposed to address other strategically important areas
- The Partners were finalists at the "Best of the Best" KTP award ceremony in 2012

3. Further collaboration through new KTPs

Apart from the ongoing development of the Pyroguard EW product the R&D plan recognised the need for improvements in two areas to ensure the future success of the business;

- Manufacturing: improving the quality and consistency in manufacture to enable production of larger sizes, and to ensure consistent product quality and reduce costs with the objective;

  ‘To review and understand fire resistant glass manufacturing and quality issues and model and implement improvements’

- New Product Development: replacement of a bought-in insulating glass (Pyroguard EI) product with an innovative, proprietary product enabling both market and profit growth, with the objective;

  ‘To understand the science underpinning the performance of silicate based intumescents and current fire insulating glasses and to develop an innovative, proprietary product’
3.1. Manufacturing KTP

The approved proposal was for a two year project and the Associate recruited in 2010 had a Masters in Chemical Engineering. The Academic involved was Dr Harvey Thompson, School of Mechanical Engineering. The aims of the project were to:

- Develop an understanding of the scientific and process issues affecting product quality
- Develop and employ automatic process monitoring technology
- Develop an improved and flexible manufacturing process to give uniform product thickness with minimal bubble inclusions
- Integrate a computer based product quality system into production
- Enhance the knowledge base of the manufacturing staff

The KTP came to a successful conclusion with the following achievements during the project:

- Designed and implemented a bespoke film thickness monitoring machine
  - Measurement achieved in seconds rather than 2 man hours manually
  - One fifth of the cost of a commercially available machine
- 25% improvement in resin thickness distribution with scope for 50% improvement post KTP through further process optimisation of existing manufacturing process
- Established an internal optical quality standard as international standard doesn’t exist
  - Enabled reliable comparison between competing products
- Introduced 6 sigma methodologies into manufacturing
- Embedded a culture on continuous improvement within manufacturing
- Modelling techniques for the complex fluid dynamics in manufacturing were developed and are in routine use
- Effective solutions for resin mixing and dosing were specified and initial trials indicated that further step changes in product quality and manufacturing productivity are possible post implementation
- There were 3 undergraduate projects supporting the KTP and the academic team have an ongoing relationship with CGI

As a result CGI has a range of technical solutions to long-standing product quality issues which were; variable resin properties; non-uniformity of resin thickness between glass sheets; bubbles in the resin; and lack of an optical quality standard. As a consequence the management board was convinced of the wisdom of implementing an ongoing investment strategy to enable advanced manufacturing in CGI. The Associate was employed by CGI to continue implementation of process improvements. The company supervisor, Dr Vince Crook, said;
‘KTPs provide an excellent mechanism for harnessing a technical knowledge resource far beyond the scope of an SME to solve issues where the intervention of “big brains” and new ideas are required. Associates are commonly highly skilled and motivated and can thrive in this partnership environment’

3.2. Product Development KTP

The approved proposal was for a three year project and the Associate recruited in 2010 had a PhD in Polymer Science and the Academic involved was Professor Jim Guthrie in the School of Chemistry. The aims of the project were to:

- Develop a proprietary fire insulating (EI) glass system to replace bought-in product
- To reduce vulnerability to losing external supplies in a growing market
- To produce a lighter weight product not susceptible to loss of optical clarity due to water ingress with time and which could be manufactured in larger sizes
- To significantly reduce manufacturing costs compared to the existing, externally sourced product

The KTP came to a successful conclusion with the following achievements during the project;

- Significant new knowledge of inorganic polymer systems developed
- Ability to design inorganic polymer systems to meet performance requirements
- New pilot scale polymer manufacturing facility installed
- Pilot scale products passed full scale fire tests, impact and UV durability tests
- Issues involved in scale-up for full scale manufacture identified and solutions found
- Final formulations undergoing testing at end of KTP
- 2 undergraduate and 4 postgraduate projects with one postgraduate becoming a CGI employee

As a result of this KTP CGI now has; an innovative, new product that is lighter and thinner than anything else on the market that can be manufactures at a significantly lower cost; enhanced confidence in R&D capabilities; reduced reliance on the expensive, factored EI; and the Associate was recruited to oversee future development of the EI product line. During the KTP a French competitor was acquired with existing manufacturing capacity that could be modified thereby enabling a very short time to market for the EI product. There is also very significant potential for this product in new geographical territories which will enable substantial future business growth in export markets.
The company Supervisor, Dr Vince Crook, said;

‘KTPs provide an excellent mechanism for harnessing a technical knowledge resource far beyond the scope of an SME to solve issues where the intervention of “big brains” and new ideas are required. Associates are commonly highly skilled and motivated and can thrive in this partnership environment’

Prof. Jim Guthrie, the academic supervisor added;

‘The extent of cross-fertilisation of concepts, interpretations and ideas between the industrial and academic team members, counselled by the KTP Office and KTP Adviser, has been great – leading to opportunities for the development of people, research and the potential for further collaboration’

4. Summary

Through successfully engaging in KTP CGI has been transformed as a business and is looking forward to the future with a huge degree of confidence. The University of Leeds has gained significantly from the partnership in terms of feedback into research and teaching and employment opportunities and is looking forward to continuing to work closely with CGI into the future as their academic partner of choice. Finally, three very high calibre Associates have gained excellent experience and received the ultimate reward for their endeavours - employment in the progressive company that CGI now is.