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ELŐSZÓ

Az Eszterházy Károly Egyetem kiemelt figyelmet fordít kutatási eredményeinek, valamint innovációinak a megismertetésére mind szélesebb körben konferenciák, workshopok, nyomtatott és elektronikus folyóiratok formájában egyaránt.

Ez utóbbi megvalósításához nyújt lehetőséget az intézmény számára a TÁMOP-4.2.3-12/1/1KONV-2012-0047 „Kutatási eredmények és innovációk disszeminációja az energetikai biomassza (zöldenergia) termelés, átalakítás, hasznosítás a vidékfejlesztés és a környezeti fenntarthatóság terén a Zöld Magyarországért" program, melynek keretében útnak indítjuk a „**Journal of Central European Green Innovation (JCEGI)**" című elektronikus folyóiratot.

Az intézményben folyó széles körű kutatások egyik kiemelt iránya a zöldenergia minél szélesebb körű hasznosítása, azokon a területeken, ahol erre adottak a lehetőségek, illetve az új innovációkra fogékony a környezet. A vidéki lakosság számára ez kiemelten fontos, hiszen ezeken a területeken egyre nagyobb problémát jelent a megnövekedett fosszilis energiaár, illetve a munkanélküliség, amelyek együttesen kezelhetőek ezen irány előtérbe helyezésével. Kutatásaink során számos területet vizsgáltunk már korábban is – biomassza, speciális fűtőberendezések, speciális fóliatakarások –, melyek azt igazolták vissza, hogy ezt mindenképpen folytatni – a lehetőségek kibővítésével – szükséges.

Az intézmény az Észak-magyarországi régió egyik meghatározó tudásbázisa, küldetésének vallja, hogy a régió fejlődése nem képzelhető el a tudás megosztása és együttműködés nélkül. A folyóirat alapításával teret kíván nyitni a régióban keletkező kutatási és innovációs eredmények publikálásával azok széles körű megismertetéséhez, a fentebb megfogalmazott célok teljesüléséhez.

A szerkesztők

INTRODUCTION

Eszterházy Károly University pays special attention to disseminate its research results and innovations increasingly as widely as possible in conferences and workshops as well as in print and electronic journals.

The implementation of the latter by the institution is aided by the TÁMOP-4.2.3-12/1/1KONV-2012-0047 program "dissemination of research results and innovations in the field of biomass energy (green energy) production, transformation and utilization in the field of rural development and environmental sustainability for a Green Hungary" in the framework of which the electronic version of the "**Journal of Central European Green Innovation**" will be launched.

One of the key directions of the wide range of research at the institution is the more widespread utilisation of green energy in areas where the possibilities are appropriate and where the environment is receptive to new innovations. It is particularly important for the rural population since in these areas both the increasing fossil fuel prices and unemployment present an intensifying problem which can be treated simultaneously by giving a priority to this direction. A number of areas – biomass, advanced heaters, the use of special plastic greenhouse covers – have already been examined during our research activities which have confirmed that these experiments must by all means be continued – with a wider range of available possibilities.

The institution is one of the knowledge base of Northern Hungary mission believes that the development of the region cannot be achieved without the knowledge sharing and collaboration. Foundation of the journal would open up the region resulting from the publication of results of research and innovation is broad awareness, the fulfillment of the objectives set out above.

The Editors

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STRATEGIC EVALUATION OF THE ENERGOCELL GLASS FOAM GRANULATE AND ITS DEVELOPMENTAL POSSIBILITIES / AZ ENERGOCELL ÜVEGHAB GRANULÁTUM STRATÉGIAI MEGÍTÉLÉSE ÉS FEJLESZTÉSI LEHETŐSÉGEI

JUDIT OLÁH – RÓBERT TACSI – MIKLÓS FÁRI – JÓZSEF POPP (CORRESPONDING AUTHOR)

Summary

Daniella Industrial Park Ltd. is the first domestic manufacturer to exploit the advantageous properties of glass foam, which offers solutions to the problems that arise during construction, where thermal insulation has a load bearing capacity. With continuous development, it aims to produce a new product by extending the use of glass foam, and reducing the harmful effects of glass waste on the environment. The goal of the paper is to develop a corporate strategy for the new field of activity of Daniella Industrial Park Ltd. in order to increase sustainability and develop good practice for other firms. We used several methods for analyzing both the external (PEST analysis, Porter's five forces model, external factor evaluation matrix), and internal environment (internal factor evaluation matrix) to gain as much information and as much understanding of the glass foam granulate product so we can decide how far the strategy envisaged by the management can be implemented in Hungary. The company lays emphasis on increasing competitiveness and promoting the efficient use of the product. This would make a form of glass foam insulation that has been used for decades in Western Europe, also available to consumers in Hungary. To increase the competitiveness of the company and to increase the market share the building of green trust is important. The strategy that achieves the highest score is the product development and the production of higher value added products; according to our analysis, this would be the most practical choice.

Key words: *glass foam granules, environmental protection, insulation, company strategy*

Jel code: Q42, Q55

Összefoglalás

A Daniella Ipari Park Kft. első hazai gyártóként az üveghab előnyös tulajdonságait kihasználva megoldást kínál az építkezések során felmerülő azon problémákra, ahol a hőszigetelésnek teherviselő tulajdonsággal kell rendelkeznie. Folyamatos fejlesztéssel új termék előállítására törekszik, kiterjesztve az üveghab felhasználási területeit, csökkentve az üveghulladék környezetre gyakorolt káros hatásait. Kutatási célkitűzésünk a Daniella Ipari Park Kft. új tevékenységi körével kapcsolatos vállalati stratégia kidolgozása. A külső (PEST elemzés, Porter 5 modellje, külső faktor értékelő mátrix) elemzéshez és mind pedig a belső környezet (belső faktor értékelő mátrix) elemzéséhez több módszert alkalmaztunk, hogy minél több információt nyerjünk, és minél nagyobb rálátásunk legyen az üveghab granulátum termékre ahhoz, hogy eldönthessük, mennyire valósítható meg magyarországi viszonylatban a vezetőség által elképzelt stratégia. A vállalat hangsúlyt helyez a versenyképesség növelésére és a termék hatékony felhasználásának megismertetésére.

Kulcsszavak: *üveghab granulátum, környezetvédelem, hőszigetelés, vállalati stratégia*

Jel kód: Q42, Q55

Introduction

States participating in the Kyoto Protocol have undertaken to reduce their carbon dioxide emissions by 5.2% below 1990 levels, with Hungary's commitment being a 6% reduction. Dependence on external energy sources and increasing greenhouse gas emissions are a global problem. These problems can be solved by reducing energy consumption by increasing energy efficiency. As nearly 40% of all energy consumption is used in buildings, the European Commission intends to achieve significant energy savings in this sector. Environmental protection has been an important issue for years, so selective waste collection has been the focus of interest. Several types of heat insulating material can be produced from recycled glass. As a consequence, selective waste collection will protect our environment in two ways: on the one hand, the amount of waste decreases, on the other hand, heat-insulation reduces the carbon emissions and thus contributes to the goals of sustainable development.

"Sustainable development is a development that can meet today's needs without jeopardizing future generations' opportunities to meet their own needs" (Brundtland Commission's formulation from 1987) [Szlávik, 2005, 42.]. The definition of the term which has been used since the Rio de Janeiro Conference of 1992 uses other words, but with similar content. "Sustainable development recognizes the development that meets today's needs without endangering the living conditions of future generations" [Sachs, 2000, 25.]. The World Wide Fund (WWF) definition is: "Sustainable development is improving the quality of human life within the sustainable capacity of ecosystems" [Havas, 2002, 17.].

One of the solutions to these aspirations can be the processing of glass waste with an "upcycling" recovery solution: producing useful heat-insulating materials and glass foam from harmful materials which burden the environment. The propagation of glass foil has become a major issue as the Directive [2010/31/EU] stipulates that all buildings should have close to zero energy requirements after 31 December 2020 (for buildings in public ownership and used by public authorities this requirement is effective from 31 December 2018). Within the European Union, the highest proportion of buildings with low energy efficiency is in Central and Eastern Europe.

The energy requirement to produce the granule-shaped glass foam in panel and tube form is much less than the currently available heat-insulating materials with similar properties (e.g. rock wool). With panel-shaped glass foam products, a complex thermal insulation system can be implemented, which significantly reduces the energy consumption of buildings, so even low-energy buildings such as passive homes or zero-energy houses (so-called zero-energy buildings) can be built. All in

all, glass foam as a heat-insulating material combines the properties of currently available heat-insulating materials (rock wool, XPS, EPS, etc.). It is characterized by qualities such as high thermal insulation, fire resistance and mechanical strength, as well as resistance to insects, birds and other pests. Its high thermal insulation properties are ensured by the large amount of gaseous material contained in the glass foam. Its heat-insulating ability is comparable to rock wool, but as a material it is much more solid, formatted, and dimensionally stable. Furthermore, it can be more highly loaded, and does not deform after long-term loading, due to its cellular structure. As for its frost resistant properties, these are excellent because water and moisture cannot penetrate the closed cells. By its ability to break capillary flow, it protects against upward humidity, but can even drain water when used as a suction layer. It is made of closed cells, so it does not become damp and does not swell, and so this capability can protect other wall elements (e.g. fired clay masonry) from frost damage. With glass foam, the static stability of soils which do not bear weight, such as peat or moist soil, can be greatly increased. Because of these properties, its use is much more advantageous than rock wool, EPS or XPS insulating materials.

After investigating Hungarian construction statistics, it has become apparent that in recent years, construction sub-sectors have developed in which some form of glass foam could be applied, such as the renovation of individual building types, which represents a 4.33 increase. In addition, economically feasible glass foam insulation can be one of the stimulating alternatives to the currently low growth Hungarian construction industry.

Our research objective is to develop a corporate strategy for the new field of activity of Daniella Industrial Park Ltd. We analyzed the current state of the enterprise, its resources and capabilities, and the opportunities provided by the external environment.

Guidelines and regulations for waste management in Hungary and the EU

As a result of human society's rather unsustainable development in the 20th and 21st centuries, the amount of waste has grown, and its components have also changed. Wastes that pose a threat to the environment and the number of substances that cannot be degraded have also increased. Waste management should therefore play an increasingly important role in environmental awareness. The regulation of this phenomenon is decisive for contemporary society, and transforming it is absolutely essential to adapting to contemporary demands.

Domestic waste management regulations are a relatively recent phenomenon. Increasing industrial and agricultural production, the consumption patterns of the

population and legal harmonization obligations have also made the procession of waste management at the legal level necessary. Essentially, waste law only emerged as a concept from the mid-1970s when the Council of Europe established Directive 75/442/EEC and related Commission decisions. In Hungary there was no general framework law for waste before 2000. A comprehensive collection of environmental legislation was published in 1994, which contains provisions on waste management in Chapter 3 and further provisions in the Act on General Environmental Protection. Hungary undertook detailed legislation on waste management when it joined the Organization for Economic Co-operation and Development in 1996. Furthermore, the creation of the law was an indispensable condition for entry into the European Union. On May 23, 2000, Parliament established the first Waste Management Law in Hungary [2000. XLIII. Law on Waste Management], with which a start was made to remedy serious deficiencies.

In 2008, the European Union adopted a new Waste Framework Directive [Directive 2008/98/EC on waste and the repeal of certain directives], which required Member States to implement the provisions of the Directive within two years of the year 2010. Based on the provisions of the Directive and the experience gained since the entry into force of the first Waste Management Act, the Hungarian Government decided to create a new waste management law in the interests of more transparent regulation. The new waste law came into force on January 1, 2013 with a two-year delay. The new law was created in the spirit of the 'life-cycle approach', which means that the product must be designed to minimize damage to the environment throughout its life cycle, from generation to final disposal. In our opinion, it was therefore essential to introduce the principle of extended producer responsibility.

In EU environmental policy, waste management issues were always decisive. The first environmental action program provided for the harmonization of legislation, and the second a comprehensive waste management policy. In the third action program, prevention and recycling appeared, while the fourth emphasized the need for clean technologies and waste recycling. The fifth action program laid down substantial requirements for the year 2000. In the sixth action program, waste management was linked to the rational use of natural resources.

The European Commission [European Commission 2017/A] is undertaking a range of actions to support the move to a more circular economy. These cover the cycle from production and consumption, to waste management and the market for secondary raw materials. In a circular economy the value of products and materials is maintained for as long as possible and waste and resource use are minimised. This can contribute to innovation, growth and job creation. The circular economy package, adopted by the Commission on 2 December 2015, has created an im-

portant momentum to support the transition towards a more circular economy in the EU. This package included legislative proposals on waste, with long-term targets to reduce landfilling and increase recycling and reuse. The wider benefits of the circular economy also include lowering energy consumption and carbon dioxide emissions levels. Hence, the circular economy has strong synergies with the EU's objectives on climate and energy and with the Commission's recently adopted package on ‚Clean Energy for all Europeans [European Commission 2017/A]. Its overall aim is to increase confidence in the Construction and Demolition waste management process and the trust in the quality of Construction and Demolition recycled materials. This will be achieved by: Improved waste identification, source separation and collection, Improved waste logistics, Improved waste processing, Quality management, Appropriate policy and framework conditions [European Commission 2017/B].

Since glass manufacturers in the United Kingdom are involved in the production and reuse of white glass, the vast majority of glass waste is green glass. That is why the price for this is the lowest. Wholly mixed glass from landfills is generally not suitable for use in the refining industry where color purity is vital, and has therefore been used in alternative ways. However, with new sorting techniques, it is already possible to make use of the scrap waste in the refractory industry. In recent years, a large number of British glass recycling companies have invested in new glass selection technologies that allow a high level of sorting and separation of mixed glass pieces above a certain size. By using these technologies, the problem of color pollution seems to be resolved, and the aim is to use as many recycled glass bottles as possible during manufacturing processes. Despite the fact that the glass can be re-melted many times, alternative uses are also sought, such as pavement coverings. In March 2015, DEFRA (Department for Environment Food & Rural Affairs) reduced the United Kingdom's glass packaging recycling target to 75%, the target previously being 81%. This objective will be increased to 76% in 2015, and from 2016 to 77%. The export market for recycled glass is extremely important in the United Kingdom and the multinational nature of the largest glass manufacturing companies is largely due to the large volume of glass exported to Europe. Contrary to what is commonly used in the United Kingdom, foreign companies in wine-making countries such as Italy, Spain and Portugal are happy to get as many mixed glasses as possible for the production of green glass. These countries are the main beneficiaries of glass exported from the United Kingdom and subsequently used for the production of wine bottles.

About 3% of municipal waste is a glass, so in the whole country 76 thousand tons of glass ends in landfills each year. Glass is not just rubbish that causes concern and incurs cost, but a valuable waste that can produce secondary raw materi-

als, thus saving resources. The 60% municipal waste scrap recycling rate expected by the European Union is currently 47% in Hungary, and 32% for glass packaging waste (beverage and bottling glass), which the production volume of the first Hungarian glass foam manufacturing plant will help to increase. In every area, it is necessary to shift the perspective of the cyclical economy towards recycling, away from the unmanageable waste of the linear economy. In 2016, packaging glass recycling rates in EU countries are based on 2013 figures. It turns out that Hungary with its 32% rate is among those bringing up the rear. Sooner or later Hungary needs to improve this rate so that the currently unnecessary glass waste will not be landfilled or sent abroad, where it will need to be repurchased unprocessed or as product packaging.

Possibilities for using glass foam granulate

Useful, heat-insulating materials and glass foam granules can be produced from harmful, environmentally-damaging materials and glass-waste. Glass foam has been manufactured for decades, mainly in Switzerland, Austria, and Germany. In the field of thermal insulation solutions, the Energocell glass foam granulate is superior in its high compressive strength and good thermal insulation, due – among other advantages - to its time and cost savings and its environmentally friendly properties. The success of the concept is based on the fact that all parties benefit from glass foam: the customer saves money with reduced construction time and the environment benefits from recycled material.

The known properties of glass foam - its excellent heat-insulation, good load-bearing properties, capillary-flow breaking capability, the fact that it is time-saving and cost-saving, large, lightweight, and stable, does not age, and is resistant to all pathogens, - all confirm its effectiveness and profitability. International examples show that glass foam can be successfully used in the creation of passive houses, floor insulation for industrial buildings, cold stores and industrial assembly halls, walkable or green roofs, ceiling fillings for lightweight buildings, the construction of sports and ice rinks, roads and railways, ground heat storage units, heated car suspension, swimming pools and noise protection walls. The product is made of 100% recycled glass scrap, the vast majority of which has come from Hungary.

The positive potential for glass foam is also indicated by the fact that in 2016 the Hungarian standardization body issued two standards specifically for the technical specifications for factory made foam glass products.

1. MSZ EN 14305: 2016: Thermal insulation products for building engineering and industrial use. Factory made foam glass products. Technical Specifications.

2. MSZ EN 13167: Thermal insulation products for buildings. Factory made foam glass products. Technical Specifications.

Dangers associated with using glass foam granulate

Like everything in the world, the use of glass foam may be accompanied with dangers. Since we are dealing with a relatively young product, do the experts have enough information to find out what kind of effects the material has on humans after installation? Does it belong to the radioactive group of substances or not? Are carcinogenic substances released from glass foam or not? We cannot answer these questions with complete certainty. Experts need to look at the product in built-in environments over decades in order to provide scientific evidence to support these issues. In any case, the currently available studies show that the product is safe and has no detrimental effects on the human body. In addition, it also has the advantage that the raw material required for glass foam is a material considered to be waste. At one stage in the production of glass foam, large amounts of glass powder are released during glass cleaning, which can normally be harmful to people working in the factory. Glass dust extraction is guaranteed by several high-performance air cleaners (dust extractors) that clean the glass dust from the production unit. Considering all harmful and useful properties, it can be stated that glass foam is an extremely useful thermal insulation material with outstanding properties that contributes to glass recycling. Of all the better known heat insulating materials, it has the lowest production energy costs, but since waste material is the input product, the energy cost can be compensated with state subsidies.

All in all, it is worth mentioning that it is worth considering the glass foam product, because the number of scientific publications, the number of patents, and industrial needs all point in the same direction.

Material and Methods

Daniella Industrial Park Ltd. is the first domestic manufacturer to exploit the advantageous properties of glass foam, which offers solutions to the problems that arise during construction, where thermal insulation has a load bearing capacity. We used several methods for analyzing both the external (PEST analysis, Porter's five forces model, external factor evaluation matrix), and internal environment (internal factor evaluation matrix) to gain as much information and as much understanding of the glass foam granulate product so we can decide how far the strategy envisaged by the management can be implemented in Hungary.

Examination of the external environment

The external environment analysis provides information about buyers, competitors and the environment (e.g. economic, political, social), information that is critical to a company's strategic decisions. The company under investigation also needs this information to see how stable they are on the market, so we have conducted external environmental analyses and an external-internal SWOT analysis.

PEST analysis

In order for the company to make a decision that can ultimately make it work efficiently, it is essential to get to know the external (macro) environment. The tool for this is a PEST analysis, which involves mapping the political, legal, economic, social and technological environments. The ever-changing external environment can create new opportunities for an adaptable company, but it can also be a source of serious threats, so it is important for the company to continuously observe the wider environment.

Political and legal environment

Companies have to follow changes in politics, legislation, and lower level legal regulation that can affect their market behavior in a favorable or unfavorable way [Kotler, 2000].

Economic environment

It is important that the economic actors buy the product. Therefore, an analysis of the economic environment is indispensable when examining the macroeconomic environment. "The 'health status' of the economy can be inferred from a whole range of indicators, such as employment, interest rates, consumer indebtedness, rates of return, industrial production and housing construction data." [Kotler, 2000].

Social environment

Social factors include the cultural aspects and health consciousness, population growth rate, age distribution, career attitudes and emphasis on safety. High trends in social factors affect the demand for a company's products and how that com-

pany operates. Furthermore, companies may change various management strategies to adapt to social trends caused from this (such as recruiting older workers).

Technological environment

Significant technological developments have taken place over the last few decades, which, of course, are still ongoing and even accelerating. A company must be aware of the possible modalities of technical development. If an unfamiliar path is revealed, then the company must decide whether it is worth taking up the channel in the new technology field in the hope of success. For companies, both undertaking innovation and being left behind are very risky [Kotler, 2000].

Porter's five forces model

The external environment can be analyzed with Porter's five forces model, also known as competitive force analysis (Figure 1), a structured method for analyzing the micro environment, and within this the competitive environment. According to this model, the 5 forces in the external environment: competition between companies on the market, development opportunities for substitute products, suppliers' bargaining power, buyers' bargaining power, and possible new competitors, determine the external environment for the business.

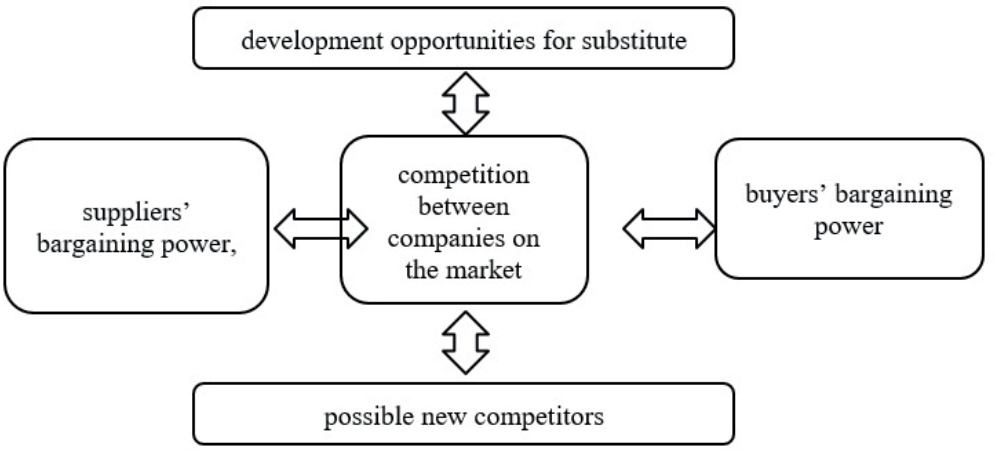

Figure 1 Porter's 5 forces model
Source: Authors' own elaboration, [Kocsis, 2000]

After the review of the external environmental and a brief internal environmental SWOT analysis, we will look at the actual internal environmental analyses. The SWOT analysis is used to prepare for important decisions for situation analysis. It provides information that helps align corporate resources and capabilities with the competitive environment. The use of SWOT analysis is also useful in the formulation and selection of the strategy to be adopted [Pahl - Richter, 2007, Fine, 2009]. Selznick, (1957) first called attention to the importance of matching internal factors and external expectations.

Results

Examination of the external environment

PEST analysis

Political and legal environment

Hungary can be considered politically changeable, despite the fact that the current government is already in its second cycle, and in the second half of it, so greater changes are not expected for at least 1-2 years.

The product produced by the company is made of 100% recyclable waste glass, which is also very positive from the environmental and waste management point of view. For this reason, the company may be given an opportunity by increasingly stringent environmental standards that may be sources of dangers and threats to other companies. EU environmental policy can have an incentive effect on both trade and renewal. Waste management also occurs through legal regulation. In Hungary, the new Waste Management Act is valid from 2012 (effective from 2013 onwards), its main purpose being to minimize waste and recycle as much as possible. There are a small number of glass waste recyclers in the country, which is also an opportunity for the company as the main raw material for its product is glass waste. The nationalization of waste management can be a danger to the enterprise. Waste management was nationalized by the government; according to the rules valid from January 1 2013, a new public service license can only be granted by a state or local government majority owned and controlled by the state or a municipal authority. From an economic point of view, the range of available tenders is important, which is a possibility for the company, but the evaluation of these applications is extremely lengthy and bureaucratic, with a total lead time of up to one year.

Economic environment

For macroeconomic economic analysis, in the first instance it is important to highlight the development of the country's GDP. In Hungary, GDP has grown steadily in recent years (33.712 billion HUF in 2015, 2.9% higher than in the previous year), including GDP per capita (11,056 EUR/person in 2015). In addition, industrial production increased by 7.1%, construction output by 3.2% and new industrial orders by 10.3%. Foreign trade has seen an increase in recent years, with both exports (by 7.1%) and imports (by 5.4%) increasing compared to the previous year. It is important to note that the exchange rate of the forint is very weak, and this is favorable for exports, meaning those economic actors who are exporters can get more revenue. The weak currency will increase the cost of imports, and the more expensive imports will make innovation more expensive, as the acquisition of more advanced technologies will be expensive [Csath, 2016].

Unemployment in Hungary has declined to 6.1% [KSH, 2016], partly due to the public works program. Furthermore, a significant number of people work abroad for higher wages and, of course, for a higher standard of living. In any case, it is positive for a company that the 2014-2020 tender cycle is still active, so the range of applications and grants available is very wide. This will allow for more investment, such as enterprise and site development, technology development, capacity building, etc.

Social environment

The population of Hungary is decreasing and by 2010 it had fallen below the psychological limit of 10 million. It is also a challenge for society to grow older, and in Hungary the aging of the population is accelerating. For the workforce, the quality of education is important for enterprises. The number of vocational school students dropped considerably until the turn of the millennium, while since then there has been a slow rise again, since labor market shortages have been caused by the significant shortages in vocational training. The number of students in tertiary education is also high, thanks to state-funded courses.

From the point of view of the company's products made of recyclable waste, it is important to mention society's growing environmental consciousness. Hungary does not have this kind of high-level culture as in Western countries, but the environmentally-conscious way of life is also spreading here. Furthermore, it is important to emphasize that confidence in Hungarian products is constantly growing.

Technological environment

One of the most important indicators of the technological environment is infrastructure. As the company's headquarters and sites are located in all major cities, we can say that infrastructure provision is favorable. The company is easily accessible both by public transport and by freight and passenger vehicles. The environment is optimized for energy and telecommunications, as all the services needed for seamless operation are available.

Porter's five forces model

Competition between rival companies

a. Competition between competitors - the most powerful tools

- **Reduction in prices:** In the absence of a local manufacturer, the company should only pay attention to foreign competitors. The price of a product's raw material can be lower than other glass foam products, and does not have high shipping costs.
- **Emphasis on quality:** Imported glass foam products are unlikely to compete with lower product prices due to the higher transport distances, so they may rely on their own more established production, - referring to their greater experience - and an emphasis on higher quality.
- **Additional functions, products:** The supplementary function and product variation of the basic product is the smaller glass foam granules which are produced by grinding following the same production method. This product can be sold at a higher price with higher added value, so competitors can attack more strongly through this product. The same is also the case, however, if the firm itself enters export markets with this variant, making a competitive advantage of more labor-intensive production – i.e. its cheaper labor force.
- **Extra service:** With a new product on the domestic market, the business has to take greater responsibility in the field of customer consulting and customer inquiries. It should hold up-to-date professional tutorials, prepare experts to advise on proper use of the product, and develop its product on the advice of professionals.
- **Extension of Warranty:** The company must ensure that the guarantee which is required and justified on the domestic market is better than those of local

competitors in a foreign market, in order to enhance trust. Liability insurance is also important, as a marker of additional trust for buyers. Quality assurance and product quality certification is also of paramount importance.

- **Publicity, advertisements:** At this point the company does not have to deal with a strong competitor presence on the domestic market. Conversely, the total industry's marketing costs may be borne by the business. It is important to reach those who can offer (contractors, traders) or plan (designers) the product.

b. Competition can be expected

- **The number of competitors is growing:** It is possible to expect competitors to appear, but only after the product has come to market and become known. The return on high cost technology purchases takes a long time in the relatively small Hungarian market, especially considering the product's unfamiliarity. It is of the utmost importance that the company cover the domestic market with an excellent product and service, creating as many and as difficult barriers for future entrants.
- **Competitors have the same power**: This possibility exists, but given the previous points, the company enjoys an advantage, which must be maintained with excellent service and coverage.
- **Reduction in demand for products**: The product is scarcely present on the domestic market, so it is not possible to sell a smaller quantity, with a strong substitute product hardly present. There is a greater risk of failing to introduce the product properly to the market. It is difficult to prepare a new replacement product without familiarity with it.
- **Overall price reduction:** Due to the novelty of the product and the appearance of the business as a sole manufacturer, there is less reason to fear price erosion. Reduction in prices is mainly due to substitution products. In case of a new entry, the firm must expect a price war.
- **Lack of consumer brand loyalty:** The Hungarian market is particularly price-sensitive, but supports recognized brands in its purchasing decisions. In the event of an insignificant price difference – if it is reasonable - the new competitor can be squeezed out.
- **Fixed costs are high:** Manufacturing costs are high, which make it difficult for new competitors to enter, but this is dangerous for the company if it is involved in price competition because it also has to deal with high fixed costs.

- **Consumer demand decreases**: As a new product, demand cannot be reduced; it may turn out to be uninteresting to the market. Research has revealed the opposite, so it is up to the company to work on a successful product introduction and maintaining interest. Demand drops after customers' bad experiences, which can primarily be avoided by delivering outstanding product and service quality.
- **Mergers and acquisitions are frequent:** Because of the lack of production facilities, this is not a threat to the firm on the domestic market.

Conditions for entry to the competition

a. Obstacles

- **Lack of experience:** According to research, the professional experience required for production is not available in Hungary, therefore it is less possible for a domestic entrepreneur to appear. Due to a foreign enterprise's professional experience, it is more likely to enter, although with the disadvantage of a lack of local connections, which can be built up.
- **Strong consumer loyalty:** Since the product is not on the market, consumers cannot have become loyal to other manufacturers. The question is, can the firm build on a successful introduction as the first firm on the market?
- **Strong brand recommendation:** Not present.
- **Government regulatory policy:** In many cases the current government is characterized by centralist measures; there is a real danger of provisions that adversely affects the business. On the other hand, no such measure is expected to allow other players to enter the market.
- **Strict customs duties:** Not present.
- **Lack of raw material processing:** This is secured, so does not prevent a competitor's entry.
- **Protected patents:** There is no patent, or (expired) protection for the basic product, so only proprietary technologies, processes, and certain features can cause entry barriers.
- **Unsuitable location:** None present.
- **Market saturation:** As a new product, the market is not saturated; it does not create an obstacle.

b. Opportunities

- **Higher/better quality products:** The quality that a company wants to manufacture meets or exceeds the quality of the foreign manufacturer's product.
- **Lower prices:** In the absence of other domestic producers, only imported materials are available, the prices of which are not lower, and whose total cost is higher due to higher delivery costs.
- **Significant marketing tools:** A good marketing mix is beneficial to the business.

Development Opportunities for Substitute Products

- **Advantage of substitute products in the case of falling prices:** The most significant substitute product is polystyrene, whose raw materials are derivatives of petroleum and thus heavily exposed to oil price changes. In addition, it is made from primary raw materials rather than recycled waste, which means that it is unlikely to significantly reduce its price.
- **If the customers' cost of switching is lower:** Because polystyrene products are more widespread than glass foam, switching to glass is more likely than vice versa. It is not only the prices of high-pressure polystyrene derivatives which should be examined here, but the cost of ancillary technologies and labor, as well. Of the two products, glass foam is probably more competitive.

Suppliers' bargaining power

- **Number of suppliers, their concentration:** The number of potential suppliers found is low, they have an established market, often with overseas customers, which is likely to result in long-distance transport and higher costs. It is an advantage that the company can also recycle types of waste glass that other manufacturers do not.
- **Supply of replacement raw material is scarce:** This risk is not present for the substitute product, but due to different raw material requirements and suppliers, the business is not affected either.
- **Switching to other raw materials is expensive:** Since glass foam can only be produced from glass (glass waste), the availability of glass waste is limited.

Buyers' bargaining power may be strong

- **If customers are concentrated:** Because the product is used for construction projects, including private construction, construction sites can be found throughout the country, so the location of customers is not geographically or organizationally (e.g. purchasing stores) concentrated.
- **If the product is standard, non-specialized:** The product is unique as a new concept, providing a unique solution, so this does not strengthen buyers' bargaining power.
- **If buyers can switch to another brand or substitute product cheaply:** Since there is not - at present - any company that has the same product on the domestic market, this is not a threat, and the imported product is more expensive due to higher transport costs. Conversely, substitute products can replace the product, something for which the firm must be prepared.
- **If the buyer is extremely important to the seller:** In a limited number of cases, there are major actors in certain areas, because of references obtained, and their capacity utilization. Overall, this is not a strong reason for the firm undertaking to weaken its negotiating position in this way.
- **If consumer demand is extremely important for the seller:** When a company is starting production, making a product known, has capacity utilization, or experiences strong seasonal weakening – e.g. a lack of construction activity in the winter - a price reduction may be justified. The reasons for this can be dealt with through alternative solutions, e.g. during the winter period of falls in sales, greater maintenance and production shutdowns can be introduced.
- **If buyers are aware of the prime cost of the product:** The prime cost of the product is unknown or may be volatile depending on the market price or availability of the raw material.

External factor evaluation matrix

Key external factors	Weighting	Rank	Weighted index
Possibility			
Growing construction industry production	0.06	3	0.18
Established, known manufacturing technology	0.05	4	0.2
There is no other manufacturer on the domestic market	0.05	4	0.2
Distance of the nearest foreign manufacturer	0.04	4	0.16
The acceptance of Hungarian products is favorable	0.04	4	0.16
Bank support	0.04	4	0.16
Tightening standards - sustainability	0.03	4	0.12
Favorable energy prices	0.04	4	0.16
Strengthening environmentally conscious approach	0.01	2	0.02
Low interest base rate	0.03	4	0.12
Glass is not degradable, with little recycling	0.03	4	0.12
Transportation of glass waste abroad is expensive – in Hungary it needs to be transported a shorter distance	0.03	4	0.12
Weak HUF - better export price	0.01	3	0.03
Dangers			
Institutional reorganization, nationalization (waste management)	0.06	3	0.18
Changing economic policy environment	0.06	3	0.18
Existing glass scrap buyers can offer higher prices	0.06	3	0.18
Capital intensive activity	0.06	3	0.18
The required increase in the recycle rate of scrap waste - a decreasing supply	0.06	2	0.12

Lengthy consideration and payment of applications and grants	0.04	3	0.12
Lack of a high-quality workforce	0.04	3	0.12
Expensive license	0.03	3	0.09
Hardly known in the domestic market	0.05	2	0.1
Attack from substitute products	0.04	2	0.08
Difficult to change approach to the use of traditional thermal insulation products	0.04	2	0.08
Total:	**1**		**3.18**

Table 1: External factor evaluation matrix for the glass foam product line
Source: Authors' own research, 2017

The above average result of 3.18 (Table 1) shows that the company under examination has significant strength to cope effectively with the external threats and exploit the market opportunities that it is offered. This is largely due to the fact that there is no other manufacturer on the market, the manufacturing technology is known and the market segment is prospering again, so the return on investment is likely to be higher, all of which cannot be negatively influenced by the variability in the economic and political environment and the lack of a high quality workforce.

SWOT analysis

- In the **internal and external analysis** the internal and external factors of the enterprise - its strengths and weaknesses, and environmental factors - are assessed as opportunities and threats (Table 2).

<table>
<tr><th rowspan="2">Type</th><th colspan="2">INTERNAL FACTORS
Factors that can be influenced by the company</th><th colspan="2">EXTERNAL FACTORS</th></tr>
<tr><th colspan="2">Factors not influenced by the company</th></tr>
<tr><th colspan="2">Strength</th><th>Weakness</th><th>Opportunity</th><th>Threat</th></tr>
<tr><td rowspan="6">Political, economic</td><td rowspan="2">advanced infrastructure</td><td rowspan="6">high energy intensity,
low energy efficience</td><td>growth in construction industry output</td><td>volatile economic policy environment</td></tr>
<tr><td>tightening standards - sustainabilit</td><td rowspan="2">institutional reorganization, nationalization (waste management)</td></tr>
<tr><td>synergy with its own interests</td><td>favorable energy prices</td></tr>
<tr><td>wages below wage levels in Western Europe</td><td rowspan="2">weak HUF - better export price</td><td rowspan="2">slow evaluation and payment of supports and grants</td></tr>
<tr><td rowspan="2">favorable geographic location</td></tr>
<tr><td>lack of a high quality workforce</td></tr>
<tr><td>Socio-cultural-demographics</td><td>metropolitan site - labor supply more favorable</td><td>proximity of residential neighborhood - possible noise effects</td><td>strengthening of an environmentally conscious approach</td><td rowspan="2">difficult-to-change approach to the use of traditional thermal insulation products</td></tr>
<tr><td>low base rate</td><td>changes in the price of energy</td></tr>
<tr><td>the acceptance of Hungarian products is favorable</td></tr>
</table>

Technological, natural	the development of known technology	complex level of energy supply development	glass is not degradable, little recycling	costly license
	use of power generation equipment		developed, known manufacturing technology	
Management and capitalization	management experienced in other activities	medium capitalization	bank support possible	capital intensive activity
	strong network of contacts	over-dependence on bank in case of credit		
		employees' abuse of production technology information		
Marketing	the opportunity to introduce the product to the market as a new product	process of customers acquiring familiarity with product introduced as a novelty can be protracted and costly	no other manufacturer is present on the domestic market, the closest known is a long distance away	product almost unknown in the domestic market
		the possibility of damage resulting from incomplete surveys and knowledge		attack from substitute products

Production R + D	contact with research institutes	inexperience in the planned activity	transportation of scrap abroad costly – in Hungary transport is over shorter distances	existing glass scrap buyers can offer higher prices
		lack of adequate expert knowledge		the required increase in the recycle rate of scrap waste - a decreasing supply
		lack of knowledge of suppliers		

Table 2: SWOT analysis of external-internal factors

Source: Authors' own research, 2017

The analysis of Table 2 shows that the enterprise has a significant number of outside risks which it cannot influence, such as a changing economic environment (reorganization of institutions, nationalization of waste management), ad hoc decision-making by policy makers, the fact that it is too bound to environmental protection regulations (authorization to deliver waste is tied to a named driver), slow tender evaluation and payment of grants (payment of the subsidy 10-12 months after the submission of the application). To compensate for its internal weaknesses, it must devote considerable energy and resources, in particular to: improving capital adequacy (capital intensive investment, e.g. 1 kiln, valued at 150 million HUF), acquiring the necessary professional knowledge (during the research there was no Hungarian expert in glass foam production), protection of production technology information (employees do not use their research or production results for their own ends). Above all, the introduction of the product as the first manufacturer is a time consuming and costly task.

With detailed elaboration we have prepared Table 3, which, in some aspects, compensates for the size these mistakes and deficiencies, or even offers a complete solution to the problems.

	STRENGTHS	WEAKNESSES
OPPORTUNITIES	**Offensive**	**Change oriented**
	growth of marketing and promotional activities in the segment	starting dual courses to develop expert workforce
	entrance of existing competitors can make a price strategy more difficult	adoption of renewable energy sources
THREATS	**Diversified**	**Defensive**
	expansion to new geographical markets	creation of glass waste preparation sites
	product development and production of higher added value products	motivating and educating workforce

Table 3: Important feature of the SWOT analysis

Source: Authors' own research, 2017

Analysis of internal environment

After the review of the external environmental and a brief internal environmental SWOT analysis, we will look at the actual internal environmental analyses (Table 4).

Internal factor evaluation matrix

Key internal factors	**Weight**	**Rank**	**Weighted index**
Strength / benefit			
Possibility of introducing new products	0.07	4	0.28
Advanced infrastructure	0.05	4	0.2
Use of power generation equipment	0.07	1	0.07
Lower wages than Western Europe	0.05	4	0.2
Favorable geographic location	0.05	3	0.15
Synergy with the company's existing interests	0.03	4	0.12
Metropolitan site - labor supply is more favorable	0.03	4	0.12
Further development of known technology	0.05	2	0.1
Management experienced in other activities	0.04	3	0.12
Strong network of contacts	0.03	3	0.09
Contact with research institutes	0.03	2	0.06
Weakness/disadvantages			
The process of introducing the product to the market as a new product is costly and protracted	0.06	2	0.12
The possibility of damage resulting from incomplete surveys and knowledge	0.07	1	0.07
Changes in the price of energy	0.04	3	0.12
Complex level of energy supply development	0.04	3	0.12
Over-dependence on banks in case of loans	0.04	3	0.12
Employees' abuse of production technology information	0.04	2	0.08
Inexperience in the planned activity	0.05	2	0.1
Lack of adequate expert knowledge	0.06	1	0.06
Lack of knowledge of suppliers	0.04	3	0.12
Residential proximity - noise pollution	0.03	2	0.06
Medium capitalization	0.03	3	0.09
Total:	**1**		**2.57**

Table 4: internal factor evaluation matrix for glass foam products

Source: Authors' own research, 2017

Based on the weighted index of the internal factor evaluation matrix, the company surveyed does not fully meet the mission and vision set out in the strategic objective. The current internal environment supports the achievement of the targets, but energy price fluctuations and excessive bank constraints and the risk of introducing a new product are high.

External and internal factor evaluation matrix

Matrix 3-4 2-2.99 Strong Medium			**External factor evaluation matrix values**		
			1-1.99		
			Weak		
Internal factor evaluation matrix values	**3-4**	**high**	Strong development	Opportunity for development	Choice
	2-2.99	**medium**	**Opportunity for development**	Choice	Slowly withdrawing
	1-1.99	**low**	Choice	Slowly withdrawing	Withdrawal

Table 5: External and internal factor evaluation matrix
Source: Authors' own research, 2017

The internal matrix evaluation values are 2.57, while for the external matrix evaluation, this figure is 3.18; so on this basis (Table 5), the recommended strategic decision is the development opportunity.

Strategic choice and results

Choosing a strategy is an indispensable decision for a business. The strategy choice helps the firm make the best possible decision from the current state, and then, with the help of external and internal environmental analysis so far conducted, the firm can successfully implement the decision.
In the present case, - that the new product of the business will succeed in the market - we will explore three possible strategies that can help the long term survival of the new product when it is introduced.

1. Geographically New Market Growth - (STR1).

2. Product development and production of higher added value products - (STR2).

3. Introduction of Dual Training - (STR3).

Returning to the three strategies we recommend, we examined and ranked the QSPM (Quantitative Strategic Planning Model) analysis using the criteria and weights of the external and internal evaluation matrix (Table 6). Each strategy has been ranked separately for attractiveness (VG), in terms of how important it is for a particular strategy. Then, together with the weighting and rank, we arrive at the full effect (TV).

STR 1			**Possible strategies**					
			STR 2		**STR 3**			
	Essential factors	**weighting**	VG	TV	VG	TV	VG	TV
OPPORTUNITIES	Growing construction industry production	0.06	4	0.24	4	0.24	1	0.06
	Established, known manufacturing technology	0.05	2	0.1	4	0.2	4	0.2
	There is no other manufacturer on the domestic market	0.05	1	0.05	2	0.1	1	0.05
	Distance of the nearest foreign manufacturer	0.04	4	0.16	1	0.04	1	0.04
	The acceptance of Hungarian products is favorable	0.04	4	0.16	1	0.04	1	0.04
	Bank support	0.04	1	0.04	3	0.12	1	0.04
	Tightening standards - sustainability	0.03	1	0.03	1	0.03	1	0.03

	Favorable energy prices	0.04	1	0.04	2	0.08	1	0.04
	Strengthening environmentally conscious approach	0.01	3	0.03	4	0.04	2	0.02
	Low interest base rate	0.03	1	0.03	1	0.03	1	0.03
	Glass is not degradable, with little recycling	0.03	1	0.03	4	0.12	1	0.03
	Transportation of glass waste abroad is expensive – in Hungary it needs to be transported a shorter distance	0.03	1	0.03	1	0.03	1	0.03
	Weak HUF - better export price	0.01	4	0.04	3	0.03	1	0.01
THREATS	Institutional reorganization, nationalization (waste management)	0.06	1	0.06	1	0.06	1	0.06
	Changing economic policy environment	0.06	1	0.06	1	0.06	1	0.06
	Existing glass scrap buyers can offer higher prices	0.06	1	0.06	1	0.06	1	0.06
	Capital intensive activity	0.06	1	0.06	1	0.06	1	0.06
	The required increase in the recycle rate of scrap waste - a decreasing supply	0.06	1	0.06	1	0.06	1	0.06

	Lengthy consideration and payment of applications and grants	0.04	1	0.04	1	0.04	1	0.04
	Lack of high-quality workforce	0.04	1	0.04	1	0.04	3	0.12
	Expensive license	0.03	1	0.03	1	0.03	1	0.03
	Hardly known in the domestic market	0.05	1	0.05	1	0.05	4	0.2
	Attack from substitute products	0.04	1	0.04	1	0.04	1	0.04
	Difficult to change approach to the use of traditional thermal insulation products	0.04	1	0.04	1	0.04	1	0.04
STRENGTHS	Possibility of introducing new products (skimming off)	0.07	3	0.21	1	0.07	2	0.14
	Advanced infrastructure	0.05	4	0.2	3	0.15	1	0.05
	Use of power generation equipment	0.07	1	0.07	4	0.28	3	0.21
	Wages below wage levels in Western Europe	0.05	1	0.05	2	0.1	1	0.05
	Favorable geographic location	0.05	4	0.2	1	0.05	2	0.1
	Synergy with the company's existing interests	0.03	1	0.03	4	0.12	1	0.03
	Metropolitan site - labor supply is more favorable	0.03	1	0.03	1	0.03	1	0.03
	Further development of known technology	0.05	2	0.1	4	0.2	4	0.2
	Management experienced in other activities	0.04	3	0.12	4	0.16	2	0.08
	Strong network of contacts	0.03	4	0.12	4	0.12	1	0.03
	Contact with research institutes	0.03	1	0.03	4	0.12	4	0.12

WEAKNESSES	The process of introducing the product to the market as a new product is costly and protracted	0.06	1	0.06	2	0.12	1	0.06
	The possibility of damage resulting from incomplete surveys and knowledge	0.07	1	0.07	1	0.07	1	0.07
	Changes in the price of energy	0.04	1	0.04	1	0.04	1	0.04
	Complex level of energy supply development	0.04	1	0.04	2	0.08	1	0.04
	Over-dependence on banks in case of loans	0.04	1	0.04	1	0.04	1	0.04
	Employees' abuse of production technology information	0.04	1	0.04	1	0.04	1	0.04
	Inexperience in the planned activity	0.05	1	0.05	1	0.05	1	0.05
	Lack of adequate expert knowledge	0.06	1	0.06	1	0.06	1	0.06
	Lack of knowledge of suppliers	0.04	1	0.04	1	0.04	1	0.04
	Residential proximity - noise pollution	0.03	1	0.03	1	0.03	1	0.03
	Medium capitalization	0.03	1	0.03	2	0.06	1	0.03
	Total:	**2**		3.18		**3.67**		2.93

Table 6: QSPM analysis

Source: Authors' own research, 2017

Table 6 shows that the STR3 option proved to be the weakest, so the idea of introducing dual courses was removed. In second place is STR1, which was a fairly risky option considering that the company had not even introduced the product on the domestic market. If it no longer counts as a new product and has a stable background, it can be opened up to geographically new markets.

Thus, the strategy that achieves the highest score is the product development and the production of higher value added products (STR2). It can be thought of in different use packages, from the granulate it is possible to make basic bricks, sheets and piping which can be used in various construction operations in a variety of ways.

Conclusions

The biggest opportunities are on the domestic market and in the neighboring markets of Eastern and Central Europe, as new technology and hence fewer competitors are expected. The cheap and high-quality thermal insulation system can help the thermal insulation challenges of existing buildings in these countries, as well as the achievement of the EU's objectives for 2020.

The research company's research laboratory will not stop its activities with the launch of glass foam granules, but is working on creating new and innovative ideas. The company develops sorting, milling, heat treatment and testing technology that can use hazardous and non-hazardous glass waste as a closed system and produce environmentally-friendly, high-value innovative products, glass foam granules and glass fiber foam insulating products. The new, innovative technology features a unique, compact way of operating an all-in-one glass foam manufacturing process, from the raw material selection to production of the finished product, and the development of a complex production information system for the process of coordinating, supervising and analyzing production processes to achieve optimal quality.

Thus, the strategy that achieves the highest score is the product development and the production of higher value added products (STR2); according to our analysis, this would be the most practical choice. This option is the most feasible with low overhead costs, since the basic product is already available and only one (or at most two) work phases will be needed to produce a new or additional product, e.g. after grinding the product it will be smaller so it can be used in other areas.

During the implementation of the project, special machines and devices are developed that are necessary for the technology but cannot be purchased commercially.

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