

GIVING YOU THE POWER TO BE YOUR BEST

Abstract

Badische Stahl-Engineering is an engineering and consulting company, whose mission is to give our business partners the power to perform at their best with the know-how gained in our own steel mill Badische Stahlwerke.

The following paper explicates some ideas which we are considering as the present challenges of the steel industry, particularly the mini-mill family, and then show our approach how to manage them.

Even though the profitability is presently high, the steelmakers have to face the challenges today in order to achieve sustainable success in the future:

- **Steel production** has been **rising** for years world-wide and according to IISI the growth will remain on the same level at least till 2010. A huge part of the growth will be brought by the installation of new capacities, particularly in booming regions with a disproportionately high rate of raising steel demand. But part of the growth will also come by the increase of productivity of existing plants, mainly in regions with moderate growth rates of steel demand.
- Despite increasing and imposing mergers between steelmakers, the **concentration process** in the steel industry is just at the beginning, which derives the question, if the offer – demand balance will support the high prices in the future?
- Steelmakers are not only in a competition with other steelmakers but also in a **competition for resources** (human kind as well as material and financial kind). And this existential competition will certainly remain to be the case.

We see four main levers challenging the steelmakers in providing sustainable Return on Assets:

- **Raw Material** supply, which means to secure the optimal charge mix taking quality, availability, price and related conversion cost into account
- Management of **Product Portfolio**, which means the production of the right products at an optimum profitability
- **Personnel**, which means to ensure the performance of the most important asset in mini-mills
- Excellence in **Operations**, which means a highly efficient, low cost operation fulfilling demands on product quality and environmental protection as well as operating on the highest possible safety standard.

Keywords

Mini-mill, Present Challenges, Sustainable Success, Competition for Resources

¹ Badische Stahl-Engineering GmbH, Kehl, Germany – Managing Director

² Badische Stahl-Engineering GmbH, Kehl, Germany – Managing Director

1. Introduction of Badische Group

The **core competence** of our group is servicing the European civil construction industry by producing every steel product which goes into concrete. Thus we are structured into three branches: steelmaking, wire processing as well as technology and consulting.

The steelmaking facility is located in the south west of Germany delivering bar and wire to all our wire processing plants which also act as distribution centers. Their location is close to the main construction activities and consequently close to the place of final product application.

We are close to our customers.

The company presented in this paper, BSE, belongs to the consulting and technology branch. Our aim is to serve the international community of mini-mills by increasing their efficiency and reducing their overall cost. For that purpose we employ the know-how, which has been continuously developed in almost 40 years of EAF steelmaking within our group, and translate it to the needs and specific business environments of our partners.

The **steelmaking facilities** comprehend an EAF melt shop with two 90 t EAF equipped with 90 MVA transformers, an average tap-to tap time of 39.8 min and a productivity of 140 t/h, having produced over 2.1 mill tons of billets in 2007.

The **single line bar mill** is equipped with BSE multi-slit-rolling technology and is operated with an availability of 91.3 % of the operating time. The final rolling speed is 10 m/s. In 2007 we reached an average productivity of 86.9 t/h.

The **two strand wire rod mill** can go up to 95 m/s finishing speed and shows an availability of 96.6 %, which results in an average productivity of 179.8 t/h

We are proud of being good, but the entire organization always strives for getting better.

That's why we are aiming for 2.2 mill tons per year within the next few years.

2. Challenges of the Steel Industry

If we look at the development of the crude steel production world wide, we can identify a growth rate in the past 5 years, which many of us might not have anticipated on such a scale. Of course, this significant growth is driven by China, but the other regions also show a strong demand. According to IISI the growth will remain on the same level at least till 2010. We are operating in a growing industry. A huge part of the growth will be brought by the installation of new capacities, particularly in the integrated steelmaking route. But part of the growth will also come by the increase of productivity of existing plants.

The last years have definitively been defined by a **massive concentration** process. The most public one was certainly the merger of the two biggest steelmakers of the world, **Mittal and Arcelor**, but also **Tata having taken over Corus** is symptomatic for our sector.

However, in comparison to other industries, the steel industry is still much diversified. The **three biggest steelmakers** represent just a little more than **20 % of steelmaking capacities**, whereas the **three biggest iron ore producers** share more than **90 % of world wide capacities**. We think that this in conjunction with some other indicators makes further concentration very likely. Or in other words, mergers and acquisitions will remain to be one major answer to smoothing the ups and downs of the industry cycle. The question is:

Will the offer – demand balance support the high prices in the future?

Whatever will be the answer, we, as steelmakers, have to develop our strategies accordingly.

Today, the profitability of the steel industry for example measured in Return on Assets is on the same level of other primary industries which has not been the case if we look at the average of the last five years. So the question arises: What will the future bring?

We also see an increased pressure from shareholders to meet profitability targets. Not only does M&A need capital as shown in the previous slide, but also the nature of steelmaking requires quite a significant share of capital cost.

We are therefore not only in a competition with other steelmakers but also in a competition for capital. And both will certainly remain to be the case.

Looking at the world we currently see two different regions:

- One can be described by both, raising steel demand, which will probably even rise higher, as these countries are in a developing stage and the per capita steel consumption will increase. Steel imports represent a significant part of steel consumption, which obviously means that the demand cannot be satisfied by the domestic capacity. These are booming markets, in which usually investments into new facilities are executed if one or more other positive factors are existing like own raw material sources and/or cheap energy and/or cheap labor.
- Another region has a high but consistent steel consumption per capita. No significant increase in demand is expected there. The existing increase can be covered by enhancement of productivity of existing capacities. Furthermore, strong competition leads to pressure on higher efficiency.

3. BSE's Approach for the Industry

We adapt our approach to the business environment of our customers: For someone who wants to install new plants we provide support with know-how for technical and commercial concepts, project management, commissioning, start-up and training.

A customer who wants to increase the efficiency of the existing facilities is supported by operational and management know-how as well as by technical products and tailor-made revamps.

Even though the profitability is presently high, the steelmakers have **to face the challenges today in order to achieve sustainable success.**

We see four main levers challenging us in providing sustainable Return on Assets:

- **Raw Material Supply**, which means to secure the **optimal charge mix** taking quality, availability, price and related conversion cost into account
- **Management of product portfolio**, which means the **production of the right products** at an optimum profitability
- **Personnel**, which means to ensure the performance of the **most important asset in mini-mills**
- and **Excellence in operations**, which means a **highly efficient, low cost operation** fulfilling demands on **product quality** and **environmental protection** as well as operating on the **highest possible safety standard.**

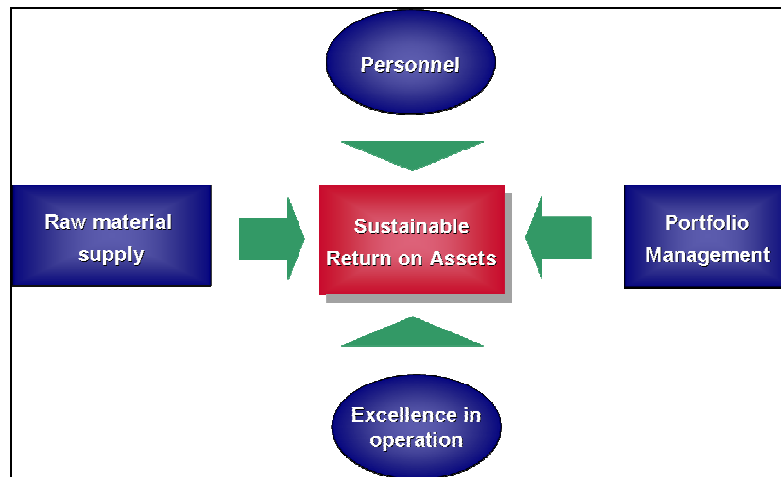


Fig. 1: Four main levers for sustainable Return on Assets

3.1 Raw material supply

If we take scrap as one major raw material for mini-mills, we see an increase in consumption at the same time as we have seen an increase of crude steel production, which shouldn't be a surprise.

But also the consumption of other raw materials like iron ore, carbon or alloys have been increased simultaneously. A further growth in crude steel production will of course go hand in hand with rising raw material consumption making it an even more precious good.

Coming back to the example of scrap, we see that huge growth has taken place in the Asia-Pacific region, which is a scrap importing region. Consequently transportation of raw material over long distances must be managed and the transportation cost have increased tremendously, too. The same is certainly valid for other raw materials.

This results in quite some differences of raw material cost in different regions of the world, meaning that the selection of raw material for the mini-mill is a local issue.

We define the metal spread by the difference between net sales prices and raw material cost. Regarding the scrap prices as a synonym for raw material prices, we can see a very stable development till the first quarter of 2003. Till then the scrap price in Europe was always around 90 Euro/ton with a restricted volatility. This changed dramatically in the first Quarter 2003, so that we see today a scrap price almost doubled and with a high volatility.

(The reason for the higher level can be seen in higher demand by increased crude steel production as shown before. But we also have to be aware of the increased volatility caused by speculation, which we haven't seen as such in the past. The stock policy of us, the scrap consumers, does not always really help to avoid the price fluctuations.

However, at the same time the sales prices have been increased by higher demand on steel products so that the metal spread, in which we have to cover our cost and generate the profit, provides us today with a comfortable situation.)

But how long will the time of comfortable metal spread last?

Besides many others, one advantage of the EAF route is the flexibility in raw material fed to the process. The choice of the correct raw material is certainly decisive for the profitability of a mini-mill and depends very much on the individual situation. As the situation can change over the years, the correct choice of raw material needs to be adapted as well.

Today we have four major sources for raw materials: Scrap, purchased sponge iron, sponge iron produced at site and hot metal produced for example in a mini blast furnace as we can see in India and Brazil.

As always, each raw material has its advantage and disadvantage regarding its availability, cost and impact on the following process steps. We have the know how to determine the best choice under the specific conditions of our customers.

3.2 Portfolio management

Beside the input also the output (products) has to be managed, since both determine the metal spread.

Highly performing products are the key to success of a steelmaker. But what does product performance mean and how do we measure it?

Traditionally we can see different points of view on product performance depending on the responsibility of the people involved.

- **Persons working in operations** measure the performance of the product and thus also their own performance basically by **productivity**, means the **tons of good steel produced in one hour**.
- **Persons working in sales** measure the performance of the product by **margin of the product sold**, which means in **Euro or Dollar per ton**.

We all know the conflict between sales and operations. Highly profitable products and low productivity or vice versa. We are convinced that we bring both together by the approach of **Profitability Performance**:

The **product margin is traditionally measured** by deducting the entire cost from the sales price. But how are the fixed cost including overheads allocated to the product, is the allocation fair and does it represent real cost of production? Or do we subsidize some products?

Therefore an advanced approach is recommended. The **contribution margin concept** deducts only the variable cost from the sales price of the product. The contribution margin of all products sold in one financial year then has to cover the fixed cost of the company and the generation of the profit.

Mentioning the financial year leads to the fact that the success of the company is finally not measured in the money earned by tons, but in the profit generated in one year. The profitability concept consequently has to respect the generation of cash per time rather than per volume.

The products produced must be seen in front of the question: How fast is cash generated? This evaluation can be done by multiplying the contribution margin of a product with its productivity, resulting in the Profitability Performance.

Having executed this analysis we have found in many cases that there are products which are low in margin but high in productivity. The traditional approach would judge them as contributing not a lot to the company's profitability. Only the concept of contribution analysis identifies them as the cash generator and as contributing highly to the success. We call these products **hidden winners**.

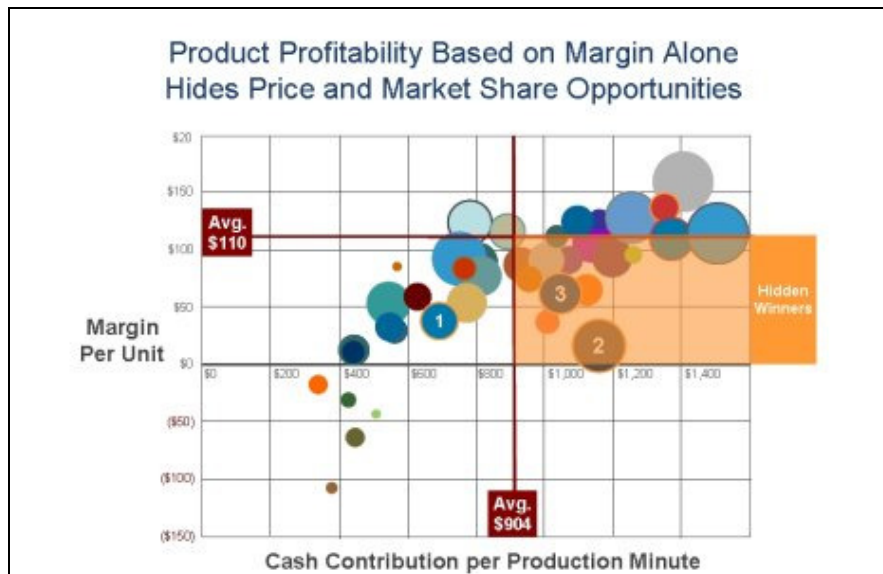


Fig. 2: Product profitability performance

(If they are not identified as such, some wrong strategic decisions can be taken, for example not pushing the sales of the hidden winners or even to stop producing them, which would result in a loss of profitability of the company. This should not be neglected especially in a capital intensive industry like steel.

For companies with several steelmaking facilities, the profitability performance concept can also act as a base for deciding which product to produce in which plant.)

With this approach you can make the right decision of products, customer and production sites.

3.3 Personnel

Of course technology is important to reach high performance and to remain competitive, of course methodology is important to analyze the situation, identify potentials and utilize them, but we consider the people working in the company as the most important asset. The products are made by people, the technology is applied by people and the methods are used by people. One of our business partners has once expressed this approach very precisely at our Symposium in 2005: “You can buy technology and you can buy methodology, but you have to invest in people”

On one hand people are very important for us, but on the other hand we see the industry in most regions of the world in a kind of “war for talents”.

This **war for talents** is caused by three major reasons:

- The **demography** of the society in which we have our production units. In most industrialized countries people are not only becoming older, but the low birth rates lead also to a lack of young people within the society. So the demographic factor makes it difficult to recruit beginners.
- But that is not all. We clearly see a lack of **attractiveness of our industry** as an employer. Let’s face it, we are seen as an old economy. We are dirty, noisy and hot. We have the reputation of having very inflexible structures and very hierarchal systems. We are not “sexy”. (Let us also mention that we are convinced that this is

not at all true, we think that there are not many other industries which can offer such interesting working places as ours. It is technically demanding, the industry is going through structural changes and we are all dealing with the personality of steelmakers, who have quite a profile. Unfortunately we are not known for this. Obviously it is more attractive for all levels of education to go other industries or sectors.)

- Furthermore there is a **lack of skilled personnel**, and this is also valid for all levels of hierarchy. In many countries there are not enough engineers with a university degree educated to meet the demand, and this in particular applies for metallurgists. Additionally countries and also companies are not anymore providing education facilities for skilled workers. Fortunately Germany has been doing this and the backbone of German manufacturing industry is certainly the high level of education of blue collars.

BSE's answer to the continuously growing demand on the skills of the workforce of any plant starts with individualizing the training scheme for the workforce. Our concept starts with the detailed definition of the demand of each working place regarding knowledge, ability and experience as well as specific qualifications.

In a team with our customer we assess the skills of each person being on such working place or foreseen to work there. The gap between the demands on the workplace and the knowledge of the person defines a tailor-made training scheme, which is then executed. The progress and results of the training is regularly controlled.

This approach is found to be very efficient to increase the skills of the entire workforce and makes them ready to take the challenges of the future.

The systematic training approach is supported by a hands-on training on site.

The manuals explain the functionality of equipment in theory and links for example technical drawings with real pictures are helping to get a good basic understanding.

Besides that they also contain lists for checks and repair as well as a description of required tools for maintenance.

(They are stored at the working places and can be used for looking up to ensure that the acquired knowledge is not getting lost. Even more the papers can be used for internal discussions and to spread the knowledge in between the ranks.)

In order to cope with the situation described before, we are presently developing the BSE Academy, which is based on our own experience of the demand of education on different levels of responsibility.

The operator level is trained in some theoretical background like Basic Metallurgy. But the main focus is on hands-on training for better skills in the field of productivity, operations, maintenance and teamwork.

The supervisor level receives very practical training in Management methods. We furthermore provide classes for how to take over responsibility and how to coordinate within his responsibility.

The Management training contains lessons in how to apply a company's culture, or if required how to change or develop it. Leadership skills are presented in a theoretical course followed by role plays, video recording and mutual analysis.

Technical knowledge is theoretically transmitted and practically shown in our plant from steelmaker to steelmaker.

3.4 Excellence in operations

Humans are making the success and have certainly a huge contribution to excellence in operations, for what BSE is well known.

Excellence in operations is very often reduced to excellence in productivity. And we went the same way.

Today we have a different view on it. We clearly see that excellence in operation means managing productivity AND cost. This is supported by an investigation which we performed with more than 40 steelmakers worldwide, asking for productivity and cost figures. The result can be seen in Figure 2.

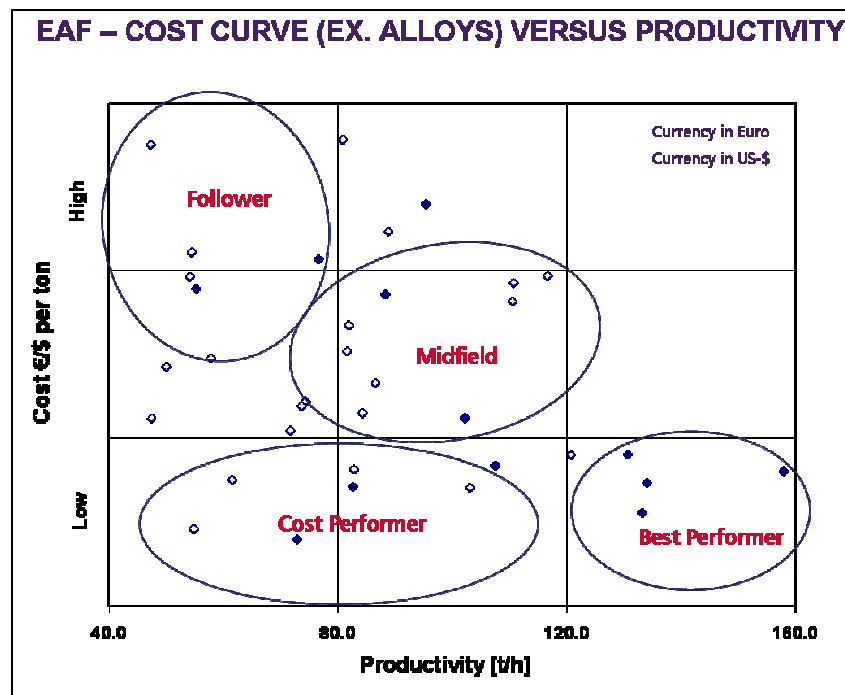


Fig. 3: EAF Cost Curve vs. Productivity

We can see that in general high productivity can mean low cost, but we can also see, that there are steel plants which have rather low cost at low productivity. The lesson we learnt is that neither only management of productivity nor only management of cost is an advanced approach. The aim is to manage and balance

Doing engineering and consulting for almost 25 years now, and based on the steelmaking experience in our own plant, we are continuously developing products to manage the main drivers of a mini-mill.

Our Consulting approach, our Revamping as well as our Oxygen Technology takes the optimization of productivity and cost into account. With decent investment we either upgrade existing equipment or we provide concepts for making existing facilities more efficient. For new plants we provide concepts, design and layouts which allow for top class performances.

Our training business, which utilizes the meltshop and rolling mills of BSW as a platform, supports the change of philosophy, attention to details and motivation of employees.

Our High Temperature Quenching system cools the off-gas in a correct way and reduces emissions from the stack. Water models and basic engineering for entire meltshops which are done together with our subsidiary Bender Corporation find the solution for shop ventilation problems.

In order to minimize the risk when taking a sample or temperature at the EAF we developed a Temperature and Sampling Manipulator taking the sample through the door.

We also do quality consulting which particularly improves processes in secondary metallurgy and casting.

For all our products we have three major demands, they have to be efficient, reliable and easy to maintain. And of course that has also been considered at the tools of our oxygen technology. Since each EAF is individual we design the oxygen concept according to the specific situation. We want to homogenize the total energy input by adding oxygen tools in the cold spots. The horizontal bath movement for equalizing the energy profile in the EAF is not only created by the Lance Manipulator but also by the direction of our Virtual Lance Burners. By doing so we smoothen the EAF operation and we increase its efficiency. The intensity of our oxygen technology takes the individual prices for oxygen and electricity into account in order to reach a cost optimum of operation.

But not only energy density or environmental concepts provide potentials for improvement. Finally an overall approach is required to reach operational excellence. This overall approach needs to consider working with people and using technology.

Our consulting cooperation therefore starts with an on-site investigation in which we analyze the existing situation, define potentials and prioritize them in an action plan in close team work with the individuals of our costumers.

Seminars, coaching and on-site assistances as well as a close contact with our partners are the tools for the roll-out of the previously mutually decided concept. Since side conditions may change or further support in the roll-out may be required, we do regular follow-ups, in which we check the status of the roll-out projects, look if the expected results are achieved or what countermeasures we need to be taken to bring the development back on track.

Usually we reach a very quick payback on investment in such projects.

As excellence in operation means both, management of cost and productivity, we consider productivity management within our consulting concept as important. Productivity management works with the reduction of process cycle times. The output per operating time shall be optimized. Therefore we divide the process time in power-on time, set-up time and delays in the melt shop, or in rolling time, pass changes and delays in the rolling mill.

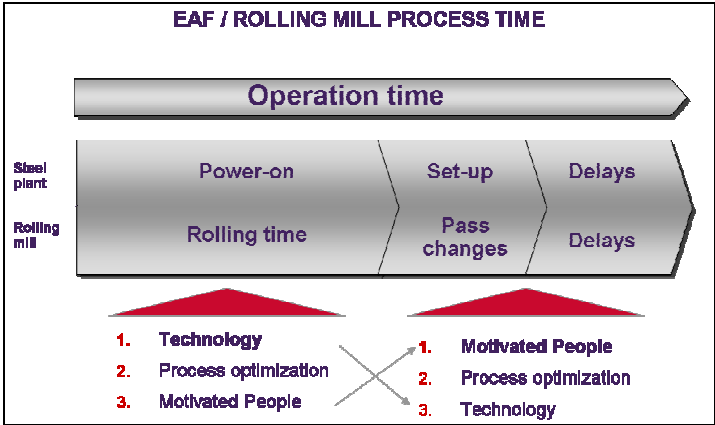


Fig. 4: EAF / Rolling mill process time

Our aim is to reduce each time always with the target to reduce the total process time. We clearly see that the leverages for the reduction of time are in a different order. To reduce power-on time or rolling time, technology plays the major role. (In the meltshop that means higher energy input and better energy utilization, in the rolling mill that means higher rolling speeds. The human impact on these times is not as big as the technical.) But if we look at the other times, the motivation level of the people involved plays the major role and certainly the technical aspects are not as important. This of course defines our consulting approach and the emphasis we stress for reaching specific targets.

4. Summary

We see the sustainable Return on Assets as an overall key figure for the steel industry. To manage this figure four main levers challenge us:

- **Raw Material Supply**, which means “**The best material mix for the EAF to individual means**” or to secure the optimal charge mix taking quality, availability, price and related conversion cost into account.
- **Management of product portfolio**, which means “**Profit Performance tools for decision making**” or the production of the right products at a optimum profitability.
- **Personnel**, which means “Qualification by BSE Academy” or to ensure the performance of the most important asset in mini-mills.
- and **Excellence in operations**, which means a highly efficient, low cost operation fulfilling demands on product quality and environmental protection as well as operating on the highest possible safety standard.

We see BSE as the know-how company to accompanying you overcoming these challenges.

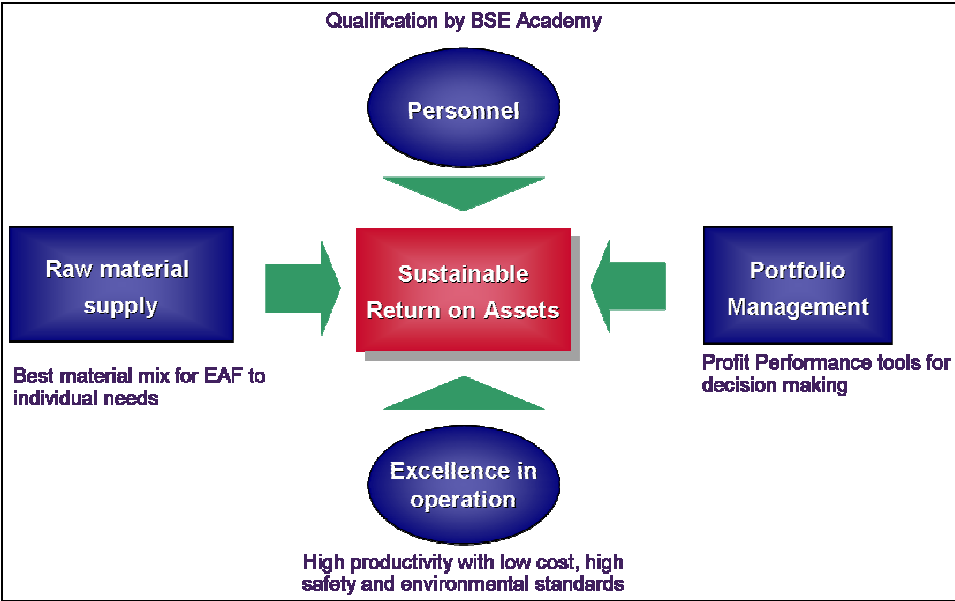


Fig. 5: BSE’s approach to cope with the four main levers for sustainable Return on Assets