CREATION OF ECONOMIC AWARENESS IN CZECH METALLURGY – INDISPENSABLE PRE-REQUISITE FOR REDUCTION OF ITS COSTINGNESS

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Abstract

The paper in its introductory part focuses on evaluation of the expected production of steel in the near future. Afterwards it deals with the main tasks of Czech metallurgy. It assesses selected aspects of economic awareness and routes for its creation. This concerns learning of the principle that worker does not work with mass, time, etc., but with value. Knowledge of selected economic (cost) concepts, methods for determination of costingness of the activity performed by the worker, measures leading to reduction of costs (again at the worker’s activity), principles of cost management in metallurgy, selected problems in the worker’s domain of activity and basic information on the state and intentions of the “home” company.

Only full mastering of the elements of economic thinking and their permanent updating literally by all the workers of each production unit creates a pre-requisite for subsequent systematic reduction of costs in metallurgy.

1. EXPECTATIONS CONCERNING PRODUCTION OF STEEL IN THE NEAR FUTURE

Let us first focus on the expected development of production of steel in the nearest period. World leading managers in metallurgy attempted to make these forecasts in [1].

Markus Moll looks at development of the main sectors. He expects global growth of automotive sector in 2010 approximately by 3%. However, 75% of this growth will come from China. Production of lorries and off-road vehicles will be decreasing, according to Moll. Shipbuilding will not recover in 2010. It seems that only public transport will see a consolidation. Outlook for civil engineering is also at least fuzzy. Building of apartments is surprisingly strong outside the North America and in some other regions. On the other hand commercial development is almost without any change. Production of machines and mechanical engineering belong at present to the sectors with the worst performance. Use of capacities is very low almost in the whole industry. Moll expects problems in 2010 due to increasing unemployment both in Europe and in North America. All this is valid for the whole world with the exception of China.

Mike Walsh claims that further growth of production of steel in Chine is possible. In 2009 production increased by 15% to 575 mil. tons, i.e. under 50% of the world production. He forecasts for the year 2010 another growth at least by 10%. Total steelmaking capacities in China are at present estimated to 720 mil. t/year, i.e. they approx. by 150 mil. t/year higher than was demand in 2009. This will keep prices of steel „under control” and will continue to make “hard life” for steelmaking companies. China also manages to resolve its problems with raw materials both in Australia and Brazil. It is expected that production of steel in EU27 was in 2009 lower by 30% in comparison with 2008. Nevertheless, it is expected that global production of steel exceeded in 2009 the volume of 1.2 billion tons.

Sandy Chim expects that demand for iron ore will increase and it will lead to another increase in prices. Price of iron ore will probably increase by 20-30% in comparison to the today’s orientation price.
Work on EU strategy till 2020 [2] is very important for prediction of development of steelmaking in the nearest period. It states that Europe needs strong and competitive industrial “base”. Global dimension of EU strategy 2020 has special importance for international sector, such as steelmaking industry. Europe is the second biggest producer of steel in World (200 mil. t/year) after China, ensuring more than double of US production. During last 20 years its production remained balanced. It avoided excessive production and focused at the same time on increase of productivity, and also on production with high added value and on services. Steel is internationally the most traded commodity after oil. European steelmaking industry therefore needs “stable playground” with competitors from third countries.

Strategy EU 2020 should focus on priorities of creation of values based on growth of knowledge, reinforcement of level of people and creation of competitive, coherent and “greener” society. It is expected from strategy that its primary industries, such as steelmaking industry, which has long-term perspective in Europe, will remain to be a backbone of European prosperity. Primary European industries are highly innovative. For example European steelmakers develop and produce thousands of new steelmaking innovations. Europe is already a world leader in technology of wind energy and leader in steelmaking technology. If we want to remain to be a world leader in technology of use of wind energy and produce much more powerful and durable wind power stations, we must also remain to be a world leader in technology of steelmaking and we must ensure corresponding production of steel in Europe. It is expected from strategy that further supports will be given to research and development in innovative technologies. EU is still far behind the USA and Japan in the field of subsidising the research and development.

The strategy states also that in this decade European steelmaking industry suffered from serious lack of qualified workers.

MEPS [3] comes with comparatively optimistic considerations about production of steel in 2010. It predicts its global increase from the expected 1217.5 mil.t in 2009 to 1350 mil t. It forecasts increases of production in all the regions during the next 2 years. Two-digit increases are expected in majority of industrialised countries in 2010. They recover at least partly from big reductions during previous 12 months. Other “moderate” increases are expected in developing countries in CIS, Africa, South America, Middle East and Asia. It is expected that production of steel in EU 27 approached in 2009 138 mil. t according to /3/. Two—digit reductions occurred in all 19 member countries, which produce steel. Steelmaking companies in Belgium, Bulgaria and in Sweden were hit the most (reduction almost by 50%). Greece, Luxembourg and Slovakia suffered comparatively the least.

Similar trends for this year are forecast also by Financial Times [4].

Somewhat more sombre outlook of production of steel in 2010 is in Germany [5]. It is said that free fall stopped in the middle of 2009, nevertheless, the expectations for the year 2010 are modest. For example Thyssen Krupp counts that its production of steel will return back to the level of the year 2007 only in 2012. Return to the growth trend is expected as late as in 2011[6]. At present it is expecte that production of steel will continue to stagnate.

If we summarise the published opinions concerning the recovery of steelmaking, what concerns Czech Republic our forecasts should be very prudent for this year and perhaps even also for part of the next year. We expect realistically that during one year or even one and a half year the global financial and economic crisis will still reverberate in our region. Only after that period we can expect more significant re-staring of economy and therefore also of production of steel.
Let us now focus on the current tasks, which ensure at the present stage for production units of Czech metallurgy.

2. CURRENT TASKS OF PRODUCTION UNITS IN CZECH METALLURGY

It should be acknowledged with thanks how the Czech metallurgical companies resolved in majority cases reduction of production brought by the world crisis. There was almost general effort not to apply mass dismissal of employees – although it had to be applied as well. The rate of unemployment achieved in Czech Republic corresponds to that it is approx. 10%. The companies rather shortened the working week to four or three days. Or they organised shutouts lasting one or several weeks. Mostly positive is also the fact that management of production units also participated in backing of losses brought by the crisis. Although reduction of their wages did not bring an important sum, it was, nevertheless, an important expression of solidarity.

Approach to reduction of costs is very important issue both for supranational companies and also for Czech metallurgy.

Surveys realised in this area by the renowned world company ERNST & YOUNG (By savings to prosperity: from cost cutting to cost optimisation) [7] among 561 top managers from 11 industrial branches gave unambiguous results. Altogether 60% of supranational companies did not introduce any active program aimed at reduction of costs. The whole one quarter of companies does not even consider it. Only 17% considers the permanent enforcement of cost-saving measures as one of its priorities. If we realise that almost generally supranational companies are ahead of national companies – what would be the results of this survey for Czech metallurgy? ERNST & YOUNG further states that in spite of the fact that cost optimisation became last year one of the key tasks of the enterprise management, the companies had focused until now primarily on temporary measures of tactical character. It is possible to include into this group the frequently referred savings by drastic reduction of participation in conferences, business trips, switching off lights in toilets, etc. According to ERNST & YOUNG it is possible to save by such steps 10% at maximum. An it is rightly stated that these measures are mostly temporary.

Quite a large part of Czech metallurgical companies can be unfortunately included into this group.

2.1 What are then the main tasks of Czech steelmakers

Each production unit must unequivocally answer the question “what it wants to achieve”? And the only answer should be “achievement of the world competitiveness”[8]. This does not mean at all that its objective tomorrow will be “conquering all” the world markets! This means in the first place that we have set for all the metallurgical products and accompanying offered services the world standards and that we will try to achieve them gradually. It is obvious that this in not achievable simply and easily! It will naturally require in majority of companies extreme efforts and overcoming of numerous obstacles! Nevertheless, there are no other objectives leading to survival! We certainly know very well that in competition in the East uses not only lower personal expenses, but unfortunately also much lower costs on environmental protection.

The second, and also unequivocal task is full use of the biggest wealth we posses – i.e. our workers. This is huge reserve of our metallurgical plants, which almost – with few exceptions – is used only partly, or not at all. We can say schematically that it means – input permanently investments into education of all employees and “adjust” their optimum motivation. We dare to affirm that this source is probably not only in Czech
Republic used absolutely insufficiently. And activation of our workers is comparatively less costly than for example new investments.

The third area, on which we must fully concentrate, is reduction of costingness in out metallurgical plants. Here too, we owe a lot.

Let us now deal with this topic in greater detail.

3. **REDUCTION OF COSTINGNESS IN OUR COMPANIES**

It follows unequivocally from the survey of the world company ERNST & YOUNG mentioned above that „**sustainable program of cost reduction must be a standard approach forming the basis of the company recovery**“. The effort aimed at cost reduction from the viewpoint of the company management must be **considered as absolutely self-evident**. Moreover – attention of the management must be oriented already by one step ahead, namely to cost optimisation (**by purposive control of their consumption**). This is contributive in a long run.

Let us now look from the viewpoint of at Czech metallurgical plants. Unfortunately big part (rather majority) would be classified into the group, the attitude of which towards cost reduction is rather disdainful.

Route to responsible approach to permanent reduction of costs (control of their consumption) leads through creation of economic awareness in our companies.

We give below a brief overview of the main principles for creation of the economic awareness.

3.1 **Main principles for creation of economic awareness in our plants**

3.1.1 Worker does not work with mass, time, etc. but with value

Each worker, for example in the steelshop, must be aware that he does not work with mass, time, etc., but with value. For example smelter must not consider that he has “on his shovel” 10 kg of FeMn, but e.g. CZK 400. He must know the prices and cost price of raw materials, materials and services, with which he works.

Let us ask ourselves, where did we see at our working sites the posters informing about prices of raw materials, energies and services, with which the worker operates? Smelter must know that if he extends meting in EAF by 10 minutes (even when he has to wait afterwards anyway), he thus irreversibly loses for example CZK 350, etc.

Each worker must know economic impacts of “results of his work” on the next production phase. It means if smelter does not oxidise the heat sufficiently, he may cause defects, which may results in production of non-conforming product (reject). Steelshop or foundry may in this way incur direct loss for example even CZK 100 000. When the charger loads “inappropriately” metallic scrap into the charging basket for EAF, he may cause fracture of graphite electrodes. This may result in a loss of e.g. CZK 50 000 and more. And so on. **It means that the worker must be aware that the value, with which he works, is being expended and that he therefore works with expenses.**

This is the departure pre-requisite for any activity of any employee in any plant. Next steps of creation of economic awareness can hardly be realised without awareness of this principle.

It means that the workers must for the next considerations acquire at least a minimum knowledge of economic (cost) concepts. It is necessary to remind that each worker must know only such terms, which he is able to understand and really use - subject to his qualification and working position.
3.1.2 Examples of selected economic (cost) concepts

Let us first try to answer the question – what is the cost in fact. It is consumption of assets and outside service including work of employees expressed in money. Do not be mistaken, for example the already mentioned FeMn, with which workers operate routinely, is also an asset. From the economic viewpoint it is classified as short-term asset. Therefore for example consumption of 5.5 kg/t becomes after its multiplication by its price (let us say 25 CZK/kg) a cost – 137.5 CZK/t. Similarly electric power (outside service – bought from Czech power plants – ČEZ) of 600 kWh/t becomes after multiplication by its price (e.g. 2 CZK/kWh) a cost - 1200 CZK/t.

Expended costs are usually related to the production unit marked as „t“. Technicians, smelters, foremen, etc. naturally know that we speak about tons. We speak therefore about specific costs. In the given case we speak about tons of smelted liquid phase, be it steel in steelshops of cast iron in foundries. We speak about so called calculation unit, i.e. products (cost units), to which we relate the expended costs. We understand by calculation unit the products (e.g. one ton of continuously cast ingots, one ton of classical ingot steel, one kilogram of the shipped casting), semi-finished products of own production (e.g. the above mentioned one ton of liquid metal smelted in EAF), work (hour), services (one repair of EAF), etc.

It is necessary to remind that the costs are determined as preliminary (planned, normed) and subsequent costs (sometimes called resulting costs, more precisely “real costs”). Subsequent costs characterise already the result of activity, for example costs of the steelshop for the past year, etc. This activity (calculation, determination – estimation of costs) is sometimes called also calculation.

We must also realise in this area that costs are usually in certain structure and concrete arrangement. Specified aggregation and classification of costs is called calculation formula. Structure of costs in calculation formula is in competence of the company and it is realised in accordance with the purpose, to which it should serve.

Depending on the concrete working position and achieved education the workers are acquainted for example with other concepts, such as added value, depreciation, selected accounting reports, etc. Only when these topics have been learned, it is possible to start evaluation of our own work or somebody else’s work.

3.1.3 Knowledge of methods of determination of costingness in the plant

If the worker has to be aware as precisely as possible of the value, with which he works, he must first be able to determine this value (calculate or estimate it, etc.). Each worker in the company (it means even the one performing comparatively the simplest operation) should be able to calculate (estimate) approximately this value. The simplest situation is when the worker knows physical indicator (for example consumption of electric power per heat), price indicator (price of one kWh) and he wants to calculate the appropriate costs both per calculation unit (for example one ton of cast liquid metal), and also total costs expended for the whole heat. Another more demanding task may be an impact of the already mentioned extension of duration of heat in EAF. The smelter should therefore know, that he can calculate this sum by summing the costs on wear of lining of the lid (e.g. 3 CZK /min), costs on wear of walls (6.5 CZK /min), and also cost son consumed graphite electrodes and consumed electric power.

The workers at higher positions should naturally know not only these principles, but also use e.g. of method of differential calculation [9], calculation of incomplete actual costs [9], etc.
3.1.4 Knowledge of selected measures leading to cost reduction

These are selected rationalisation measures in the area, in which the relevant worker fulfils his working tasks. If the worker is bricklayer of pouring ladles and melting units he gets information on how to reduce costs in the filed of linings and rammed lining. If the worker is smelter in EAF, induction furnace, etc., he should know measures aimed at reduction of costs at melting. And so on. [9].

Knowledge of these interventions should be in the first place a stimulant for their direct implementation in the given plant. Their knowledge might (should) also initiate proposals for implementation of other (similar) interventions that are suitable for concrete conditions of the given plant.

Knowledge of these measures should again be very selective. It means that workers ensuring seemingly very simple working operations should be acquainted (in suitable manner) in detail with the measures in their and the next production phase. The workers at higher working positions (including all those, who lead any working groups – i.e. for example even smelters) should be naturally acquainted in a comprehensive manner.

After that it is possible to train the workers about principles of cost control.

3.1.5 Principles of cost control in metallurgy

Principles of cost control in metallurgy is based on the following gradual steps:

a) **precise definition and “demarcation” of production phase**, in which we want to control the costs. For example phase of production of liquid metal in EAF or BOF. By this we mean the phase from preparation of charge till casting of liquid metal and handing it over to the workers of continuous casting machine (CCM).

b) one-shot (although very time consuming) **cost evaluation of the defined production phase**. In the given case this is for example determination that incomplete actual costs on liquid metal are 9186 CZK/t.

c) **realisation of repeated cost assessment** of the chosen phase. This is usually simpler and quicker. Let us remind that a situation may occur, that costingness of the evaluated phase is very low, and on the other hand the costs for the assessment itself are too high. Or we can come to a conclusion, that one or two specific costs in the investigated phase are absolutely dominant. We monitor them afterwards for example only in their physical form (for example only duration of operation of the unit, or consumption of the relevant energy).

After repeated cost evaluation we try to create a cost standard. We determined the standard first form physical quantities. We then deduce from standard physical quantities the corresponding cost standard. Afterwards we obtain by comparison with real costs a cost variance. In the case of liquid metal the determined costs are both in metallurgical plants and in foundries absolutely dominant for the produced final product. Standards will be in this case based on the standard structure of charge and additions, duration of melting, consumption of electric power, etc. Then we determine by calculation that standard costs will be for example 8900 CZK/t. The created cost variance – difference between 9186 CZK/t (real costs) and 8900 CZK/t give a cost overspend of +286 CZK/t. It is necessary to remind here that determined cost overspend need not be in concrete conditions of the steelshop interpreted automatically as a failure!

d) that’s why when we know the cost variance we perform its analysis, result of which are technical, technological, energetic, organisational and other causes, which caused it. In our case we ask, what are the causes of cost overspend by 286 CZK/t. We learn for example that 78 CZK/t was caused by
different composition of the charge (instead of reversible scrap we used a modified steel scrap, which caused increase of costs by 78 CZK/t). We have also extended duration of melting by 30 minutes (due to failure), which caused another cost overspend by 45 CZK/t. We have exceeded consumption of electric power by 40 kWh/t, which corresponds to 85 CZK/t (caused by cold furnace). And so on.

e) after having completed analysis of the cost variance and determination of the exact cause of it we prepare recommendations for the next cycle of the assessed production phase. More specifically we try to prevent the technological causes, which entail an increase of costingness. On the other hand we want that the causes, which resulted in reduction of costs, possibly repeat also in future. In our investigated case we will eliminate the cause of repeated failure, we can also modify composition of the charge, etc.

f) the last phase of these gradual steps consists of decision about repeatability of realisation of the mentioned steps sub articles a - e. Our effort perform the control process (steps a-e) after each completed production cycle at the minimum produced quantity. This is what is done for example at melting of liquid metal in EAF, BOF or in induction furnace, where each heat is monitored. Similar approach is applied at CCM. Similar situation is also at rolling of slabs and sections, forging of forged pieces, etc. Different situation is in some other production operations in metallurgical plants or in foundries. There the cost evaluation may concern for example manufacture of the same moulds (their forming) per shift (day or several days). In some production phases the cost verification is performed in dependence on concrete situation in the foundry only once.

Again, in this area too (cost control) it is not advisable to exclude the workers at the lowest positions. These principles should naturally be again presented to them in a comprehensible and illustrative manner directly on the examples taken form their working operations.

The workers at higher working positions should already know this “subject” from use of “one-shot” verifications of costingness of production phase till continuous monitoring and evaluation of costingness [8].

3.1.6 Knowledge of problems in own field

We consider this area to be also of great importance for the workers. The workers should know advanced trends in metallurgy, as well as the way “our” plant copes with them. They should know the advanced methods of management in their field and again how “our” company compares with them. They should obviously know the development trends in mechanisation and automation in metallurgy. We must also acquaint all the workers with the peak requirements concerning the quality of produced continuously cast ingots, classical ingots or castings in whole or at partial production phases.

Here, too it is necessary to adjust the relevant information appropriately to the relevant position of the worker and his level of education.

3.1.7 Knowledge of basic information about the state and intentions of the company

The workers should moreover know the minimum economic characteristics of operation (e.g. of the steelshop) in whole. And also future (development) plans of the owner of the company. Many managers absolutely deliberately underestimate this area, for many reasons. With degree of knowledge of this information increases also a probability of increased feeling of belonging to the company. This may afterward lead to identification with the objectives and intentions of the company. And this is the principal pre-requisite for situation, when the relevant worker begins to act in a certain manner at the relevant steelshop literally as
A landlord at his working site. And this completely different (in positive sense of the word) proprietary approach brings perhaps small but permanent contributions. And it is known that literally small and sometimes even tiny savings, generate big savings. And it is necessary to remind that the main objective of each production unit is (figuratively speaking) to achieve permanently maximum profits.

4. CONCLUSIONS

We consider creation of economic awareness as a principle step leading to an engagement literally of all the workers of metallurgical plants in solution of economic spending of sources in metallurgy. This activity may not be changed into the one-shot campaign, which has its end and afterwards it leaves no traces. Economic awareness in the suggested concept is a permanent process, which after its creation must be afterwards maintained continuously and permanently. Maintained not only by appropriate handing over to all the workers of new current information (for example changes in prices and cost rates, new findings achieved at development of the filed, results of production unit and its orientation), but also by continuous training concerning new rationalisation measures, methods for evaluation of results of work, etc. This activity is naturally connected with appropriate verifications of the acquired knowledge.

Implementation of an appropriate manner of motivation of all the workers aimed at their engagement in the process of creation of economic awareness must be absolutely self-evident.

It must also be added that this system can be started practically immediately and in any production shop. Moreover it does not require any significant financial funds. It activates the most precious source we have in metallurgy – natural intellectual potential of all our workers.

LITERATURE