



**Report on Sectoral Comparative Analyses of the Conditions in Timber,
Metal and Food-Processing Industries of the
North-East Region of Bosnia and Herzegovina**

**CREDO Project – Competitive Regional Economic Development
in North-East BiH**

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A. GENERAL CONCLUSIONS

Pursuant to the order of the Development Agency for North-East Region of Bosnia and Herzegovina (NERDA), CREDO Project, Phase 1, it is necessary to make sectoral comparative analyses of the conditions in timber, metal and food-processing industries of the region. The report on the current situation in energy management within SMEs, as well as the condition of technologies, services and required knowledge and skills that refer to efficient use of energy needs to comprise an analysis of identified flaws in SMEs, as well as defining of interventions for the second year of CREDO Phase 2 of the second cycle, as well as a plan of activities to improve competitiveness in local and foreign markets of the mentioned sectors.

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A1. REVIEW OF QUESTIONNAIRE AND RESEARCH METHODOLOGY

Several different methods of collecting information were used in order to prepare the Report on Applying Energy Management in Timber, Metal and Food-Processing Industries in Northeast Bosnia and Herzegovina: quantitative, field research through a questionnaire that included 45 timber, metal and food-processing companies in FBiH, RS and Brcko District. Qualitative, field research by method of in-depth interview was conducted in SMEs that have a distinguished tradition in BiH, as well as by analyzing other sources of information, whether they are related to previous operation and experience with companies in northeast BiH or the result of the latest information. Interviews were also taken directly from owners of the companies or from the management during visits that were made for the purpose of auditing.

Questionnaire that was used to audit companies in energy management comprised six groups of questions: basic information about a company; number and qualifications of employees; finance; projects and investments in a company; production costs and legislation.

A2. QUALITATIVE RESEARCH

Qualitative method of research was used to collect information that could not be obtained through the questionnaire. Since the in-depth interview covered representative companies (which can be leaders in their branches of industry), and since the companies' managers were willing to cooperate, their view of the necessity to conduct measures of energy management in their companies, position in the market, needs for qualified manpower and other problems that were mostly raised by managers was discussed.

This method allowed having an insight into the views of collocutors whose opinions can be considered relevant since they hold managerial positions in representative companies.

A3. SAMPLE FOR IN-DEPTH INTERVIEW

Method of in-depth interview covered nine (9) SMEs, three (3) timber companies, two (2) food-processing companies and four (4) metal companies.

The field part of the research was conducted between May 22 and September 22, 2009.

The sample was selected based on assessment of a local expert for energy efficiency and energy management, based on the following criteria: SMEs have been stable in the recent

past, distinguished and representative in timber, metal and food-processing industries, and particularly governed by the following characteristics:

- more than 30 employees,
- use of new technologies in the production process,
- export-oriented companies,
- positive profit-and-loss statement in past years.

The interview and the found situation show that representative companies with stronger export orientation excitedly point out the good sides of cooperation with foreign partners, primarily because of regular and safe financial transactions, that, first of all, get spent on the payment of personal income, thus improving the working enthusiasm for the majority of employees.

Monetary crisis, which has just manifested among foreign partners, resulted here in a great number of dismissals in the companies, referring to already signed contracts on long-term cooperation.

The impact on our exporters is manifested in a great number of dismissed employees, production reduced below sustainable level.

A4. QUANTITATIVE RESEARCH

Quantitative research in the filed by way of a questionnaire started on May 15, 2009, by sending the questionnaire to E-mail addresses, faxes or by way of personal takeover.

Since the questionnaire for collecting information was consolidated in order to prepare the Report on Applying Energy Management in Timber, Metal and Food-Processing Industry in Northeast BiH, with questions referring to general information about the companies, naturally, a problem of sending information emerged. That is why they were collected in the course of field research. Some of the companies approached this very comprehensively, which required considerable efforts of many persons holding managerial positions. In some cases compiling of information by the companies lasted very short (a day or two), while some still have not done it.

In the course of field research there were even situations that a company had completely changed the line of business (e.g. one company switched to become a transport company), or a company that did not show any interest for audit, while some of them, wrongly, wanted to leave an impression of an informed management, and they asked for information on financing for building small hydro and wind power stations and the like.

In the course of conducting the energy audit the following was analyzed by companies:

- sources of energy (connection to distribution network, energy plants, boiler rooms, etc.)
- bills and monthly invoices for energy sources,
- system for supplying energy to curing plants,
- heating and cooling system,
- system for compressed air,
- electrical energy system for distribution of electricity to consumers (electric motor plants, lighting and other),
- production technological process (new technologies, new equipment with increased energy efficiency, waste heat recovery and other),
- running a company from the aspect of energy use (energy management).

A5. ENERGY MANAGEMENT

Energy management represents conducting of certain organizational and technical operations in an economically reliable way, with the purpose to reduce the consumption of energy and all materials in the production process.*

Energy management means permanent dealing with energy in all structures of a company aimed at constant reducing of energy consumption and keeping the level of achieved improvements in energy efficiency. It ensures that a company or an organization constantly goes through a cycle of devising a new strategy, new planning and implementation of new actions and checks of achieved results, based on which a new strategy is created again.

There are several reasons for introducing energy management. One of very important reasons, because of which energy management should be introduced in a company, is a positive environmental impact. Not less important aspect is minimizing the production costs.

Introducing of energy management allows the following:

- observing the energy consumption in a company by production units and sectors,
- observing the energy consumption in real time,
- preparing of systematized documentation of energy systems in a company.

A6. ENERGY EFFICIENCY IN INDUSTRY

Identifying of profit potential from applying of energy efficiency in industry refers primarily to savings of electrical and thermal energy.

In the mentioned industrial sectors differences in energy use are major, just like the possibilities to increase efficiency and make savings.

The greatest potentials occur in the savings of thermal energy primarily in the use of waste heat through its recovery, which may reach even up to 30 % of energy in a process.

Therefore, a comprehensive approach to the problem of increasing energy efficiency in industry requires the ability to analyze the overall situation in industrial sector and to put together all available resources in order to improve energy efficiency in each industrial sector.

A7. CHARACTERISTICS OF ENERGY USE IN INDUSTRY

Measures of increasing energy efficiency can be brought down to actions aimed to increase the effectiveness of consumption, and interventions on energy consuming appliances.

Potentials to make savings in the consumption of electricity can effectively be grouped as savings in lighting, air-conditioning, heating, electric motor plants, etc.

Some companies, equipped with multi-function electrical energy meters, by download of registered data of electricity values about the level and character of daily consumption diagrams, we made an insight into the schedule of production process, as well as change in power consumption, active and reactive power, as well as possibilities to have them optimized.

Use of thermal energy in industry is related to specifics of technological process of a particular industry. Water and water steam are most often used as a medium, as well as hot air, mostly in drying plants and by special thermal processing. The lower the

temperature of the medium the greater is the possibility of good use of heat source, i.e. of lesser heat loss.

A8. TASKS IN THE FORTHCOMING PERIOD

1. Establishing of Industrial Energy Efficiency Network (IEEN) as a method to increase energy efficiency in the sector of industry at the state level** requires, based on experience of European countries, founding and starting the operation of educational institutions for SMEs. The idea of Industrial Energy Efficiency Network is based on Norwegian*** initiative, which represents the development of a Canadian industrial program in European conditions.
2. Forming of an institution of energy management with all consumers of energy sources or users of final energy,
3. Raising of general awareness about the necessity of a more rational use of energy, constant increase of energy efficiency in reduction of harmful emissions****,
4. Training of managerial and professional staff in energetics of industrial companies in energy management.
5. Measuring the quality of electricity in electrical energy plant of a consumer is a field that offers a broad scope of activity and represents a major challenge for support to SMEs in the future (compensation of electrical energy and capacity). Solution to this problem will often be to design and apply filter-compensatory devices in an electrical energy plant of a consumer.
6. Reduction of peak load, active and reactive power in a higher daily tariff.
7. Conducting thermo-vision measuring of electrical energy plants proved to be very useful even on such small sample. It is necessary to continue conducting these measures on electrical energy facilities of SMEs, in order to conduct detailed surveys and identify pre-malfunction situations.
8. Optimize consumption of thermal energy within technological processes in SMEs.
9. Replacement of high-energy sources of heat with (electric boilers, petroleum boilers, natural gas boilers) with low-energy sources and heat raisers.
10. Use of alternative energy sources.

*(Seminar on energy management, Neum, Ceteor Sarajevo 2009.).

** (Development Strategy of Small and Medium Enterprises in Bosnia and Herzegovina 2009 – 2011).

*** (Norwegian Institute for Energy Technology IFE (Institut for energiteknikk) from Kjeller, based on approval of Norwegian government, has developed and applied the concept of energy network, thus proving its usefulness).

**** (Competitive Ability of Companies and State"- Prof. Bozidar Matic, Ph.D., Sarajevo, 2002).

B. REPORTS OF AUDITED SMEs IN TIMBER, METAL AND FOOD PROCESSING SECTOR

B1. TIMBER INDUSTRY

Wood processing industry is highly important for the economy of Federation of BiH, RS and entire BiH, because its share in total volume of economy is immediately behind the metal industry.

The special role of timber industry can be seen in the fact that forestry and wood processing industry employ significant labor force, requires relatively low investments per one employee, which is again significant for dealing with the current issue of rural areas.

Timber industry is an important basis for development of rural areas in FBiH and RS, because in these regions offer good quality forests with significant capacities for primary wood processing.

As previously said, an insight into managers' chain of thought is important for a qualitative research. Relevant persons were interviewed, those who are familiar with the subject matter of this research and since directors, or executive directors in charge of production were interviewed, all of them were asked about their vision of the company in three, five or more years. Their unanimous position was that, in business terms, that was distant future and that their everyday duties did not allow them to look that far ahead, at least not for now.

B1.1. Research Results

B1.1.1. Qualification structure and number of employees

When it came to the number of employees, we analyzed the number of employees with higher education and those with junior colleges in relation to the total number of employees.

The ration between employed engineers and technicians was particularly noticeable because the number of technicians, they being in charge of production lines, was insufficient (the ratio should be 4:1 up to 3:1). Just as well, there is a small number of skilled workers. A distinctive feature of employed staff is that it is not in accordance with actual needs. By comparing the education of the employees and the requirements for their work posts, one can conclude that it would be necessary to replace certain staff and provide additional education to the existing staff. Changes in ration between staff with higher education, junior colleges and secondary education are noticeable. There is a surplus of non-skilled and semi-skilled workers with primary education, approximately around 60% of the total number of employees.

The basic reasons for such a bad structure of qualifications are:

- Hard working conditions (working in open space, relatively low salaries, poor safety protection, poor accommodation and diet of workers) are not attractive for young and skilled labor force to make them search for employment in this area;
- Low number of heavy duty machines in the most difficult stages of operations such as the loading and unloading stage, the stage of gathering logs and work in planting new trees and forestry;
- Due to hard working conditions, there is a noticeable fluctuation of mainly young and skilled labor force;

- Relatively poor financial situation among employees due to low salaries causes quality workers to leave searching for jobs in other industries or abroad.

By comparing the timber industries of RS and FBiH, it can be noticed that employees in RS are better educated because they employ staff who went to schools in Italy and Austria to learn about the final stage of wood processing, furniture production, etc.

B1.1.2. Company's Line of Business

SMEs in timber industry named the following as their lines of business:

- Production and sale of furniture
- Production of furniture for shelters (mostly beds)
- Production of prefab structures by the ROH-BAU system
- Production of round timber, parquetry, veneer, tables, chairs, office furniture and furniture for schools,
- Production of hardboards
- Production of pellets

Taking into account the fact that access to the international market with fierce competition will be very difficult, it is obvious that companies will need to come up with new activities, develop a new quality market strategy by putting an emphasis on design and other features of a product significant from the point of view of consumers (design, stile, color, functionality, maintenance, etc.).

B1.1.3. Needs for New Equipment and Machines

In accordance with their vision of future development, placement of new products and better processing quality, surveyed companies expressed their needs for the following equipment:

- CNC multipurpose machine – rover
- Presses for bending wood
- Microwave generators for presses
- Wide track grinders
- Processing center for cutting and polishing

Companies which own sophisticated machines know that higher education is needed to operate them and those companies which do not own CNC machines are not facing such problems.

B1.1.4. Problems That Companies Encounter

All surveyed companies expressed as the biggest problem the lack of proper legislation for wood processing industry and the lack of government support in terms of incentives, tax and contributions reliefs. There is an obvious difference between contributions paid in the RS and the FBiH.

The companies also said that high price of raw material (logs) is also a problem. The price of logs is higher than in the countries in the region, so our companies are forced to buy raw material in neighboring countries.

The next problem the companies emphasized relates to the effects of the global financial crisis which had a profoundly negative effect on the scale of production and sales.

Additional problems in this sector are:

- Disorganized activities in the market
- Unsatisfactory managers and bad staffing
- Impossibility of financing exports and investment with own funds
- High taxes
- Raw material black-market
- High dependence on import of raw material and production materials
- Debts of wood-processing company to the forestry

B1.1.5. Needs for Additional Education

There is a general opinion that favorable staffing is not crucial for accomplishing good business results in wood processing industry. Practice showed that it was possible to increase efficiency in spite of unfavorable staffing, which means that in essence, the ability of staff to efficiently use production facilities in accordance with market demands was most important. This is primarily accomplished by special training on the spot, better delegation of labor and in-service training.

Companies with small number of employees expressed the need for additional (specific) training, primarily in wood processing, carpentry and fitting.

B1.2. Current Situation in the Companies from the Aspect of Energy Management

A typical question asked by managers is 'what exactly makes up an electricity bill'? A monthly bill was explained in detail to them. The bill is issued pursuant to the Tariff system of Elektroprivreda BiH and the General Terms for Supplying Electricity and Measuring Points. The bills are made up of three separate parts (compensation for active electricity kWh, compensation for maximum peak load P_{max} and the compensation for excess in reactive electricity). Managements of SMEs had not questions about the supplied electricity because they assumed that the bill equals the amount of supplied electricity. However, all SMEs wanted to know more about the notion of 15-minute peak load or peak power, and the notion of reactive electricity. Starting with the technology of production processes in SMEs, the role of the process technologist in developing daily diagrams of electricity consumption and power was explained. They were explained that they could do load distribution during shifts, as well as during the low-price tariff. Unfortunately, for the majority of technologic processes it is not possible to do time distribution because everyone wants to work during the first shift (the high-price tariff).

As far as the reactive energy goes, the majority of SMEs pays for excess in supplied reactive energy. During the survey of the quality of electricity, it was established that there is a high level of voltage and current harmonics, which explains why some power facilities owned by private companies do not compensate for reactive electricity. Location of consumers and their position within the electricity distribution network of Republika Srpska, Federation of BiH and HZ HB, show that the further the consumers are from the power source, the composition of voltage and current harmonics is higher. This area offer great opportunities for research and presents a big challenge to help SMEs in the forthcoming

period because the solution to this problem is to design and apply filtering and compensation devices in power facilities owned by private companies.

B1.3. Recommendations for improving competitiveness in timber industry

The goal of this research, as previously said, is to assess the existing situation and the possibility for improving competitiveness in the market by introducing energy efficiency in production lines of timber industries in NE BiH. In order to get the best possible insight in overall business operations and market competitiveness, general issues were dealt with. However, when it comes to giving recommendations for improving competitiveness of companies in timber industry, priority activities specific for this sector, among others, are:

- Development of the local market in terms of supplying raw materials to processing facilities (implementation of Entity legislation on forests),
- Attracting foreign investments in modernization of production lines by creating a favorable business environment suitable for exporters in timber industry and for production of highly processed products
- Definition of an internationally recognizable local product
- Stimulation of cooperation between companies in timber industry at a regional level.

B1.3.1 Initiating the establishment of timber industry clustres

Since the majority of companies in timber industry stated that the lack of appropriate legislation and proper government support in terms of incentives and improvement of competitiveness of these companies are the main problem, the establishment of clusters is imperative.

Through clusters, companies in timber industry would be able to create a network and operate jointly on the market. They could also develop a single strategy for cooperation with state and financial institutions.

Clusterization of small companies could significantly improve the furniture production industry. These companies could be joint in regional clusters and develop a subcontracting system between small and large companies.

It is obvious that such operations require an IT system which will provide SMES with information from the market (internet, intranet and extranet networks).

B1.3.2. Educating managers or owners of companies in the field of management

Entrepreneurial management encompasses four subject matters and each focuses on management of small and fast growing companies (management of human resources, production management, quality management and marketing and sales), and the focus is on development and management of a company from its early stages to maturity.

Operational management oversees and controls existing operations by identifying areas which need improvement, rational operations, quality analysis, project management, management of changes, surveys and learning from experience, teams management, quality management, etc.

Competitiveness of companies on the market needs to show interaction between the role of the company, the government, business environment, universities and institutions which affect nationwide competition. The key topics which require further research are: introduction to competitiveness, sector competitiveness, strategy and international competition.

Management of family companies, as world economies and statistics indicate, have a dominant position in economies of the majority of countries. In this way, family companies have a significant impact on growth and development of economies. On the other hand, a problematic transfer of managerial responsibility and ownership from one generation to the other, often results in disturbances which will be felt not only by those who have direct contact with the family business which is going through a transfer, but all other business entities in contact with the family business*.

- (Institutional Infrastructure for Development of SMEs in BiH, Nisveta Osmic)

B2. METAL INDUSTRY

The extent of development and development capacity of the metal industry directly indicates the extent of its technical-technological maturity. Importance of the mechanical sector is also relevant for the development of other activities since by revitalizing and modernizing it- it is possible to secure competitiveness of the greatest part of the industry.

B2.1. Research results

This sector occupied nearly a third of the overall industry in the prewar BiH. Drop in the involvement of this industrial branch in the postwar period was caused, first of all, by the loss of international market, lack of working capital, outdated equipment as well as the lack of staff with university degrees and skilled labor qualified to apply information technology such as CAD/CAM, KATJA and similar tools and software.

B2.1.1. Qualification structure and number of employees

Some companies in this sector have, recently, introduced IT CNC devices for certain operational areas in order to increase productivity and introduce high standards in product quality product (set of ISO standards).

Common feature for all companies of mechanical industry that were evaluated is that they do not have sufficient number of employees with degrees, in particular staff with practical experience and skills. Young educated staff members are not interested enough for a fast professional promotion. Almost all of them are employed for a definite period of time which adds to the feeling of uncertainty with reference to work posts. Deficit professions are metallurgists, and vocational secondary school graduates such as smelters, ergonomists and industrial designers.

There are companies that do not have even a single employee with university degree although they expressed the need for staff with such educational qualifications in their future plans.

Problem in the Federation of BiH is that there are no (or they exist in a symbolic number) educational institutions for additional education or in service training. Shining examples are NERDA and Tuzla Welding Institute which have not only been well accepted by the users but they also facilitate certification of knowledge in line with EU and EC legislation. This practice should be continued in the future.

B2.1.2. Metal processing companies' activities

Audited companies in the Northeast Bosnia dealing with metal processing perform various activities. Regarding companies dealing with grate constructions, production of steel bridges, stainless steel (inox) alloy steel decorative fences, production of boilers and pellet stoves (and other types of fuel), galvanization and other systems of surface treatment and highly sophisticated production of car parts. Among them are, last but not the least, manufacturers of tin-coated cabinets for various purposes and aluminum foundry and steel gray.

B2.1.3. Requirements for new equipment and machines

Based on the personal perception one can say that there is a low automation level in used machines in audited companies. Automation at the level of production line is not even a part of management thinking. At present it is possible to assist companies in selecting new low consumption devices used in new technologies. Expressed desire and our vital need is to replace certain classic machines by computer operated machines in order to increase productivity and competitiveness on the market.

B2.1.4. Problems that companies are faced with

Most of audited metal processing companies' problem is a cruel interruption of a long-term business cooperation and business relations with foreign partners caused by the war developments.

Lack of "know-how" and other resources is obvious in establishing business relations, expanding and maintaining adequate business contacts.

Nearly all managers underline the high price of electricity, natural gas and other energy sources, in spite of them knowing that the price is far below the level of European prices. Therefore, production in metal processing companies is still not self sustainable. By establishing the market e.g. for electricity the prices will surely go up. The impression is gained that the Government both in Federation and RS, with lower prices (compared to the European ones) is buying social peace amongst employees and entrepreneurs.

B2.2. Current situation in small and medium enterprises of the metal processing industry from the aspect of energy management

Based on the knowledge gained so far through conducted audits in the small and medium enterprises in metal processing industry great possibilities in increasing energy efficiency in the usage of energy and energy sources of all types is evident.

Savings by reduction of losses in the use of thermal energy go from 10 to 30% of the current level of consumption kWhTE (automation of the production process, additional thermal insulation, use of recovered energy) .

When it comes to efficient consumption of electricity almost all companies have the possibility to save significant amount of kWhTE energy. Impact of the reduced consumption of energy on the reduction of monthly invoice for electrical energy is about 25% of the current amount. By introduction of alternative energy sources, optimization of the production process, substituting electrical energy to get thermal energy and other energy sources etc... this percent of reduction of the current invoice amount (expressed in BAM) can go up to 40%.

B2.2.1 Factors in the small and medium size enterprises influencing energy efficiency

The strongest influence on efficient production process and energy efficiency is held by the factors: social-economic or human factor and production or technological-innovative factor reflected in the level of outdated equipment and work tools*.

The first factor may be significantly improved by one of the following interventions:

- More regular payments of and increase in employees salaries and other welfare allowances,
- Use of adequate tools for employees' personal protection and achieving the general level of safety at work
- Reconstruction of lighting on the premises
- Installing air-conditioning systems (heating, cooling, ventilation and air filtration) with thermal energy recovery,
- Reduction of noise and vibrations.

The second factor may be improved by replacing worn out instruments of labour and equipment whilst keeping in mind technical–technological features of the old and new equipment as well as other aspects in replacing thereof.

The greatest contribution to increasing energy efficiency in the metal processing industry is reflected in the more optimal use of thermal energy (higher and lower levels). It primarily refers to the heating option of the work subject, avoiding electricity resistant and introducing high-frequent or induction principle as well as the use of thermal preheating from other, cheaper thermal sources of by way of energy recovery.

Thermal accumulation should be introduced with sensitive or latent alternators, then thermal energy accumulation by a phase transition mechanism (it refers to the industries using steam where the steam is used quite unevenly) as well as installing all types of additional thermal insulations.

B2.3. Recommendations for increasing competitiveness in the area of metal processing industry

Significant amount of finances is required for initiating and increasing competitiveness of small and medium enterprises from the sector of metal processing industry. All audited small and medium enterprises expressed their desire to procure modern CNC and other highly productive and highly sophisticated metal cutting and processing equipment.

Some of the companies from this sector had long-term contracts for cooperation with major foreign manufacturers of heavy motor vehicle chassis that due to current recession were simply put out of force, and they were forced to let off employees and apply involuntary annual leave policy.

Strengthening of competitive capacity for the international market may be achieved by continuous market research and activities correlated with the company's marketing functions.

B2.3.1. Priority activities specific to this production sector

Priority activities specific to this metal processing sector include:

- Application of modern methods in management and marketing in the metal processing sector,

- Adoption of international standards and regulations (EU directives, ISO standards, harmonized European standards) that refer to the product safety and quality,
- Introduction of quality management techniques, including issuance of necessary certificates and approvals,
- Establishing of industrial zone for small and medium enterprises and industrial clusters,
- Connection of metal processing sector into networks in order to create local market potential,
- Establishment of infrastructure to evaluate harmonization (standardization, measurement, accreditation, inspection and certification, quality management) with the requirements from relevant directives of the new approach and harmonized European standards in order to meet requirements for obtaining CE sign,
- Engage and integrate development and scientific-research potential of the state in implementing the development strategy of the metal processing sector.

B2.3.2. Initiating establishment of metal processing industry clusters

Basic requirement for successful market activities is clustering of small and medium enterprises from the metal processing industry sector. Only in case of planned clustering would it be possible to get products that could meet requirements with regards to deadlines and quality set by the world market i.e. foreign strategic partner.

A good example of this is initiative to cluster manufacturers of car parts in BiH ** with an effort to connect metal processing companies, trading companies, banks, marketing companies and exporters.

- *(Strategic development direction of metal and electrical industry in BiH, Chamber of Commerce FBiH, Sarajevo June 2003)
- ** (Strategy of development of small and medium enterprises in RS for the period from 2006-2010)

B2.3.3. Education of managers or company owners in the area of energy management

The need to implement the following activities in the area of energy management became apparent:

1. to train business management in energy management in practical models of practical problems (laboratory);
2. to introduce new knowledge and technology in the production process (either in parts of or in the total process);
3. to train in use alternative energy sources (primarily geo-thermal and solar ones) and efficient generators of thermal energy;

B2.3.4. Energy savings potential in various industrial branches

In all industrial sectors asynchronous electric motors are the most significant electrical energy consumers (about 70% of the overall electrical energy consumption). According to modern trends great potential of increasing efficiency is provided by comprehensive introduction of newly developed more energy efficient motors and production line of the variable speed drive.

For the processes in which soft-starters and frequent convertors as devices for better adjusting of production line to the needs of technological process may be successfully applied, can generate average savings of 25%.

Metal processing industry, in particular metallurgy, is an industrial branch in which a great amount of energy is used, in particular thermal energy. In certain areas of metallurgy facilities (thermal metal processing) possibilities to improve energy efficiency are vast.

In that area significant improvement is provided by ceramic high-temperature thermal recuperators which can preheat the air for combustion up to 650 degrees Celsius.

Features of these thermal recuperators are significantly better than the metal ones in particular with regards to limits in working temperatures. Process is also ongoing with regards to improving performance of rotating regenerators which can achieve temperature of preheating the air up to 1000 degrees Celsius.

Potential of energy savings of the metal sector are mainly contained in recovery of thermal energy from wastewater and gas emitted in the production process. Second of all, great possibility stands for preheating the medium in the process by way of heat released by thermal pumps and solar panels. A great number of small and medium enterprises dealing with metal processing is located in the regions with groundwater and geothermal water without even knowing that that type of energy is the cheapest and safest source, as they would obtain required thermal energy from the place where they need it. Those are the basins of the rivers Drina, Sava, Spreca and their tributaries Bosna, Ukrina, Jadar and others.

B3. FOOD PROCESSING INDUSTRY

Auditing in the food-processing sector included new, recently established companies being well positioned on the local and world market as well as renowned companies that have long-term cooperation with major world companies such as Podravka and others. Impact of the world crisis could be detected with regards to reduction of the volume of export components volume compared to the contracted amount and dynamics.

B3.1. Research results

Food processing industry has a distinguished position in the overall economy of the Northeast Bosnia and Herzegovina and makes a significant contribution to the overall employment rate in the region. There is a great development potential for small and medium enterprises in the NE BiH food-processing sector, out of which the most important ones are:

- good and accessible raw material basis,
- environment unpolluted with pesticides (rested soil)
- extensive experiences and long tradition in food processing sector,
- great possibilities of local market in substituting import,
- great possibility for production and export of organic food.

Manufacturers of fodder, beverages, dried fruit and vegetables, mushroom processing, medicinal herbs, fruit wines and one producer of industrial and pharmaceutical alcohol.

B3.1.1. Qualification structure and number of employees

The need for new employees has been expressed, in particular, for chemists and graduate technological engineers specialized in food processing that would know how to make and preserve food. There is a need also for electrical engineers and technicians who practically know how to maintain processing machines and production lines. The greatest number of all employees are non-skilled employees employed for a definite period of time and seasonal, temporary employees and cooperants.

B3.1.2 Market operations of the company

Small and medium enterprises in food industry cannot engage into experimental research of market operations. Market operations are unique and specific economical system, very complex for any small and medium size company irrespective of the type of economy they are a part of. There is a great number of bidders, users as well as the products on the market. Regarding these issues in decision-making processes i.e. business decisions, it becomes harder with the increase in element's dimensions such as number of users, bidders and products on the market. There are difficulties in small and medium size enterprises management with regards to enacting proper and timely decisions with reference to presentation on the market. The question of the right choice of food product, its design, package, functionality, quality, price, distribution option, promotion etc -is always asked. A tendency should be that only those products that could meet objective needs of consumers and users individually be produced, meaning that small and medium size enterprises be focused on production of items for which there is a real need and which are at maximum able to meet the food needs with regards to their functional, quality and economical features. Small and medium size enterprises have to identify criteria of supply and demand with reference to what they have to offer through their presentation of food product and market business approach in order to be able to enact right decisions with regards to market complex.

B3.1.3. Needs for Energy and New Low-Consumption Equipment

Food processing industry has high potential for energy savings. It is difficult to specify energy consumption in this industry because several different processes are involved. There is a need for both heating and cooling at the same time and a lot of power is used for ventilation, lightning and electric motors of machines and equipment. Until recently it was believed that energy consumption is not significant in this industry. But, recent analyses have shown that modern food processing companies consume significant amounts of energy needed for the manufacturing process.

This industry consumes a lot of water and steam for cooking, curing and pasteurization. A typical example of a complex process in food processing industry is the production of canned food, which includes washing, cooking, vacuum packing, sterilization, cold storage and other stages, which use a lot of water, heat and electricity.

In food processing industry, attempts to save energy need to be focused on:

- Minimizing the use of water in the process,
- Optimize the cooking process
- Use all ways to recover heat
- Automate the regulation process, etc.

Big companies such as Majevicanka, Bosnaplod and Semberka, are now facing a decision whether to reconstruct and revitalize their equipment in the manufacturing process or to buy new diversified equipment and automated production lines.

In planning new equipment, one should take into account energy efficient and low-consumption equipment with an efficiency certificate.

B3.1.4. Problems for Companies

A strong influence of the world market and import liberalization in BiH present new challenges, particularly for SMEs in food processing industry*.

In order to adapt to new condition in the foreign and domestic market, the following needs to be done:

1. Harmonize legislation for quality insurance and product safety with world standards (NASSR, ISO 9000, etc.) and establish institutions for certification of food quality and safety,
2. Provide financial and other support for SMEs which increase their warehouse and cold-storage capacities,
3. Change the structure of growing fruits and vegetables, but also meat production by putting an emphasis on cattle farms and milk production,
4. Production of ecologically pure products, those specific for certain areas (wild fruit e.g.) and products with trademarked geographical features (wines, liquors, etc.).

* (SME Development Strategy in RS from 2006 to 2010)

5. Hot water from thermal wells should be used for growing vegetables in greenhouses during winter (locations near Lukavac, Petrovo Selo, Gracanica, Bijeljina with the Dvorovi Spa, region around Gradacac, the stripe between Modrica and Odzak) or heat energy of groundwater by using geoprobes or heat lifters.

The shiny prospects of this branch of industry could result in reduction of import of food products by BAM 1 billion annually. There are problems in this sector such as the lack of current assets and long-term loans for this low-accumulation branch of industry.

Low production levels and high costs, insufficiently developed quality management system and quality control of food products do not make food producers any closer to harmonizing with and accepting EU directives.

B3.1.5. Priorities in Food Processing Industry

Food processing industry specific priorities, besides harmonization of legislation in terms of quality insurance and improvement of food safety with world standards (HACCP), are also the introduction of modern technical innovations in production and sales, which could substantially decrease costs by increasing productivity, lower prices and reduce fixed costs (labor force, energy, losses in general, storage, etc.).

The manner of generating and distributing income on-the-go, i.e. without allocating any funds for accumulation which could be invested in increasing one's own financial basis. Non-existent accumulation (savings) prevents investments, which further prevents creation of new values and placement of new products on the market. In such SMEs, salaries are established independently from the degree of productivity of the company. Labor force is

considered to be an expense and entire burden is carried by those employees who achieve positive results, regardless whether they are directly or explicitly visible.

B3.2. Installed Equipment and Machines

The majority of installed equipment and production lines are in line with existing levels of production, regardless whether there are individual automated or semi automated machines or production lines. The level of automation ranges from Eurotherm hybrid computers from '80s up to PLCs. There is a very small number of regulation loops, therefore the presence of workers is mandatory.

Semberka invested a lot in modernizing its production process, but that was not enough to meet EU norms. Another big investment was made by Vgroup Palis company from Brcko District in production of pharmaceutical alcohol of 99% purity. The waste mélange from sugar factory in Brcko is the basis of this production.

B3.3. Current Situation in Companies from the Point of View of Energy Efficiency

Some large SMEs have teams which deal with certain production related problems by implementing different expertise. The team joins forces, gathers different information relevant for the problem thereby creating the compensation effect. Team problem solving automatically assumes the function of a judge, given the contribution of different members of the team, because the team is viewed as an 'endless source of ideas', which could be a 'synergy multiplier' considering the quality of problem solving. Higher motives are at work in the team, which increases motivation for success, particularly when the mutual goal coincides with goals of individuals or departments.

New ideas introduces in a company, such as increased energy efficiency by introducing discipline in operation hours of machines and production lines, is possible only in companies with developed hierarchy in which the contribution of individuals can be measured. It is crucially important for all employees to accept this challenge and to take part in it embracing the competitive spirit, respecting each other.

If there is no clear hierarchy in the company, there is no possibility for optimization or energy efficiency.

B3.4. Recommendations for increasing competitiveness in the field of energy efficiency

In terms of energy efficiency, getting recommendations to increase competitiveness of information from electrical energy aspect, the companies conducted measuring of electric values relevant for evaluation of quality of electricity that SMEs are supplied with by local distribution companies. Besides, thermo-vision survey of electrical energy facilities (transformer stations and low voltage distributors), was conducted in order to determine the quality of local distributor of electricity, i.e. loss reduction in the transmission of needed energy and capacity.

B3.4.1 Initiating the conducting of thermo-vision surveys of energy distributors in a company

The conducted thermo-vision surveys of electrical energy facilities displayed numerous a priori points of malfunctioning regimes. The identified flaws and hazards (high temperatures of appliances and devices) were presented to representatives of SMEs on

the spot, which was followed by their intervention and eliminating of deficiencies. One thermo-vision survey even detected malfunction temperatures of 170 °C on transformer field 0.4 kV substation. Further conducting of this measuring on power facilities in SMEs would prove to be very useful, in order to conduct detailed surveys and recognize pre-malfunction situations.

In companies that kept a certain level of production during the audit, and thereby a level of electricity consumption that could be measured, control measuring of electric parameters was conducted for determining the “quality of electricity” that we take over from electricity distribution network.

Electric meter (they are mostly multi-function meters) registers as active energy and capacity the basic signal (for which we believe we buy it) and all other subfrequency and suprafrequency harmonic components. On inductive energy consuming appliances their impact on the user is negative (it increases relative energy loss).

B3.4.2. Education of managers and owners of companies in food-processing industry

Managers, owners of companies for food production have sufficient education to do this business within our language area. Linguistic and computer literacy is far below the required level. It is necessary to have continuous education in learning foreign languages, computer technologies of communication, entrepreneurial and operative management, as well as in management of family companies.

C. CONCLUSIONS

1. If you have more unused time due to reduced volume of production, invest in yourself. Educate yourself!
2. We must have an efficient and ecologically clean production!
3. The pressure on companies to change will be increasing every day. Those that do not improve, they certainly fall behind!
4. Employment decline of 20 to 35 % (or 35 to 60 % according to pessimistic anticipations), reflects in almost the same percentage of revenue reduction, which is followed by major social uncertainty.
5. Managers believe they do good to their companies if they do not belong to any political establishment. Being apolitical is a fact and it does not need to be avoided as a topic!
6. Management of SMEs must find answers to questions of what to produce, how to produce it and for whom to produce.
7. In strategic positioning, modern *strategic management* must select “the right thing”.
8. Through implementation of strategy, modern *operative* management identifies the selected thing “in the right way”.
9. Performances of successful management are the following:
 - Effectiveness – to do “the right thing“;
 - Efficiency – to do the right thing “in the right way”.
10. No management must be allowed to dismiss employees without the right to pension, without linked years of service, without having paid health care and social insurance!