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**SCRAP SUPPLY IN BOSNIAN AFTER WAR SITUATION -
SOURCES, QUALITY, REGULATION AND CONTROL**

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INTRODUCTION

This paper considers key aspects and correlates of safety culture and measures within foundry and to some extent steel industry. In particular, it considers prediction and possible measure of perceived commitment to safety from foundry and metallurgical as well as employees' attitudes. It is premised on the belief that an understanding of the organisational culture for safety is required to make sense of an organisation's safety systems and related performances outputs. In spite of the relatively late acceptance of safety culture importance, it has been highlighted as a contributory factor in a number of notable technical disasters.

To some extent the safety education as well as design and management of system is a reflection of possibility protection of employees to protect themselves and manufacturing industry from technical disasters. As a result, it was hypothesised that the more positive employees attitudes to safety culture, for obeying to regulations, standards, norms as well as on written or unwritten engineering rules to control and handle materials, especially hazards, the stronger would be their appraisal of commitment to safety. Before aggression Bosnian foundry and steel industry was to some extent supplied from domestic sources or grate deal from foreign market. Bosnian production before aggression of over 130 000 t castings per year and up to 2 000000 t crude steel per year imported a great deal of scrap. In after war situation foundry and steel production is not as before aggression, but there are some preparation for normal production from the point of view of sources, quality, quantity, regulation, standardisation and control of scrap. Because of after war situation there is possibility of importing uncontrolled and perhaps unknown reactive contaminated scrap and secondary raw metallic materials for foundry and steel industry. Therefore, in after war destroyed system of scrap supply and control of metallurgical scrap it is important to install such very effective system that prevent any possibility of importing any radioactive contaminated scrap.

The system has to protect foundry and steel industry from usage of radioactive contaminated scrap by control of radioactive level of ferrous and non-ferrous scrap for casting and melting processes. Control has to be founded on effective monitoring domestic and foreign scrap as well as castings and steel products by successful in plant and state borders check points detection and system based on world standards, regulations and used examination and measurement techniques. Only by develop and introduction of modern proper Bosnian monitoring system supplied with modern and effective equipment and educated personnel, it can be prevented any possibility of usage radioactive contaminated scrap. On such way safety measures can be completed.

On that way it is possible to prevent and prohibit purchasing and sale of radioactive contaminated foundry and steel industry scrap for in Bosnia and Herzegovina in after war situation. Bosnia and Herzegovina have

to import load of only radioactive free scrap. Therefore, because of the lack of any acknowledged certification of radioactive free scrap foundry industry management as well as steel industry and environmental authorities have begun to study the real possibilities of monitoring scrap before melting and prevent any incidents.

Only on under the such condition it is possible to prevent possibility of appearance of high costs of decontamination and hazards for workers and others.

1. PRODUCTION AND CONTROL BEFORE WAR

Before the war, the Bosnian foundry and steel industry were supplied with scrap partly from domestic sources but mainly from foreign market. The annual production before war recorded 130,000 tonnes of castings and 2,000.000 tonnes of crude steel. Most of the scrap was imported to secure and stabilise the production. During and after the war, despite a significant loss of production, efforts have been made to return to the normal production level in many ways.

Before aggression there was no any control of radioactivity in scrap, castings or semifinished or finished steel or iron products, as well as non-ferrous materials. In a spite of low regulation there was no control if any orphaned sources were remelted.

In the wake of the war, there has been a growing concern over the import of radioactive contaminated metallurgical scrap or low quality raw materials which are uncontrolled or of unidentified sources. In this regard, it is urgently required to establish an effective system to prevent from, to detect and to control the flow of the radioactive contaminated metallurgical scrap.

2. GENERAL CONSIDERATION AND OPERATIONAL ATTITUDE

Scrap supply in Bosnia, in after war situation, is question of personal economic attitude¹⁾ and safety culture especially. Sources, quality, regulations and control are main themes from the point of the prediction of commitment to safety in the manufacturing industry as foundry industry. This can be reason why some foundries failed. Therefore it is possible to pronounce that the safety culture, in foundry (as well as iron and steel) industry has in essence some main characteristics:

- obeying to regulations, standards, norms as well as on written or unwritten engineering rules for handling materials, especially hazards;
- positive employees attitude to safety and safety measures,

- the capacity for reflection on safety practice.

To some extent the safety education as well as design and management of system is a reflection of possibility protection of employees to protect themselves and manufacturing industry from technical disasters. As a result, it was hypothesised that the more positive employees attitudes to safety culture, for obeying to regulations, standards, norms as well as on written or unwritten engineering rules to control and handle materials, especially hazards, the stronger would be their appraisal of commitment to safety. In the wake of the war, as well as on the information about transportation of uncontrolled and of unidentified hazardous chemical and metallurgical radioactive materials through Europe with depositing in Bosnian neighbourhood, there has been a growing concern over the import of radioactive contaminated metallurgical scrap or low quality raw materials which are uncontrolled or of unidentified sources. In this regard, it is urgently required to establish an effective system to prevent from, to detect and to control the flow of the radioactive contaminated metallurgical scrap.

This study was based on a questionnaire survey of the population of employees in some working Bosnian foundries. Each of these foundries are operated in iron and steel sector and all had over 200 employees persons. The sample was composed from three basic groups of working personnel: managers (2 %), supervisors (3 %), permanent workers (95 %). Comparison of foundry personnel attitudes and influencing three factors with literature data checks conclusions of a few researchers that employee attitudes to safety is context dependent and varies by sectors. It may not be useful, in this case, to generalise the use of results derived in one sector to another; generalising results from one sector to another could be misleading. Only it is possible to conclude that there are the differences between the groups that produced surprising correlated results. In spite of high expectations of manager and supervisors and that they are more sceptical than worker, there is a lack of workers personal action for appraisal of commitment. There is no connection between quality of safety training and cultivation of personnel and personnel actions in accordance with

appraisal of commitment. There is significant connection between quality of safety training and cultivation of management and management actions. Management actions are in strong accordance with appraisal of commitment. From that position there is, not significant but obvious, relation between management actions and personnel actions in accordance appraisal of commitment. This findings are consistent with literature data on management commitment. The model emerging from these data could therefore identify managers as a key group in which to influence and improve attitudes to satisfy. Personal personnel actions for safety is not a direct predictor nor a mediator of other predictions. It can be treated as a separate outcome and not as a part of the mechanism of influence in spite of quality of safety training.

This is very important statement in connection with organisation of quality control of foundry and steelmill scrap based on personal actions of working personnel. An extracted model of behaviour means that management is more systems orientated with a confirmation of the importance of management action to safety. This proper examination and meaning about safety culture in terms of relationship between influencing factors as attitudes to safety and perceived organisational commitment to safety have to be as basement for suitable predicted system of safety control. Because of that the individual's attitudes to personal actions for safety do not seem to be influencing their appraisal of the

3. SOURCES

Before the war, the Bosnian foundry and steel industry were supplied with scrap partly from domestic sources but mainly from foreign market. The annual castings and steel production before war recorded 130,000 tonnes of castings and 2,000.000 tonnes of crude steel. Most of the scrap was imported to secure and stabilise the production. For such production it was imported nearly up to half of million tons of ferrous metal scrap per year for foundry and steel industry. In comparison to Italian and Turkish scrap import of that time, this is not too much, but it was very important for Bosnian manufacturing. But For Bosnian foundry and steel industry it is not too important quantity as safety in the these important manufacturing industry. With increasing cross Bosnian border trade the potential for contaminated metal to enter the international steel castings and product supply is increasing. In the very first step of operation of Bosnian foundries or Iron and Steel Works in some cases, radioactive scrap metal from foreign facilities (as 70.000 t of billets from Ukraine, which is known as country with the breakdown of the economy and control at nuclear facilities) is manufactured into intermediate or finish product before export in Bosnia. For example, 70.000 t of billets imported in Bosnia in March 1999, from Ukraine, was not examined, so it is not known if there is radioactive contamination. So, there is always the possibility that highly contaminated steel scrap or material could be exports to Bosnian foundries or iron and Steel Works.

During and after the war, despite a significant loss of production, efforts have been made to return to the normal production level in many ways.

Since Bosnia and Herzegovina imports a great deal of scrap metal semifinished metal and metal product each year, it is important to ensure that this metal is not contaminated with radioactivity.

4. QUALITY

In accordance to domestic classification of unalloyed and alloyed steel scrap quality there are 12 groups of steel scrap and 10 groups unalloyed and alloyed iron scrap. Quality is regulated by domestic internal quality rules and norms, standards and commonly use foreign or international standards and norms, but it is not same as for Eastern or Western countries.

In Bosnia and Herzegovina secondary materials and scrap is regulated with internal foundry or factory rules as well as by Federal law from 1997 year.

5. CHARACTERISTIC OF REGULATION

In Bosnia and Herzegovina, for a moment, it is not known any even isolated incident of melting of radioactive materials.

The control system should take a form of internationally common and acceptable standards and regulations. These standards, norms, rules and regulations have not to be only technological and technical, i.e. foundry or metallurgical origin, but it have to satisfy ecological point of view, also.

5.1. Standards, rules, norms and regulations

Because it there is no any domestic standards, rules, norms and regulations in connection with in import of metal scrap or semiproducts or final products, it is important to begin, at once, to use current existing international standards and regulations, or at least some individual countries. There are some rather old and adopted in 1990 year as Bosnian laws as:

- Low on transport of hazardous materials (Published SFRJ No.: 20/86)
- Low on radiation and measures during applying of nuclear energy (Published SFRJ No.: 62/84)
- Low on measuring units and measures (Published SFRJ No.: 9/84)
- Low on standardisation of hazardous materials (Published SFRJ No.: 38/77 and 11/80), or
- Technical standards on stocking of hazardous materials (Published SFRJ No.: 14/80 and 9/81)
- Rule on usage of radioactive materials and equipment with ionising beams, as well as protection measures against radiation (Published SFRJ No.: 40/86)
- Rules on places, methods and terminus of examination radioactive contamination with radioactive materials (Published SFRJ No.: 40/86)

or European conventions as:

- Rules on road transportation of hazardous materials (Published SFRJ No.: 59/72)
- Rules on railway transportation of hazardous materials (RID)

connected with manipulation of hazardous materials. But there are too old and insufficiently suitable for today's situation.

In this situation, the Bosnian Foundrymen's Association intend that Bosnian Authorities adopt European and individual countries standards and regulations, what will facilitate the goal of protecting the Bosnian industry and public against contaminated metal materials from foreign countries. This is especially important in connection with public protection against orphaned sources. During war and in after war situation, three times performed inquiries in Zenica in institutions and firms acquainted with radioactive sources show a plenty of orphaned sources and no trace of some radioactive sources. Therefore this action have to be focused on protecting public health while recognising the challenges presented by domestic negligence and international trade in scrap or semifinished or finished products. Therefore, Bosnian Foundrymen's Association try to act in directions of organising in one hand suitable Agency for hazardous materials on Bosnian level with small mobile unit for radiation control of scrap, orphaned source and semifinished and finished metal products and in the other hand to adopt suitable standards, rules, norms and regulations in connection with import of metal scrap or semoproducts or final products. In connection with that it is intention for preparing suitable guides for controlling and information's exchange with all institutions connected with trade or supplying of metal market.

It is not important control of imported metal, but domestic inner market or exported metals. For example, a non-ferrous metals have been exported from Sarajevo in convoy of 8 lorries. All mass have been returned from Italian border because of contaminated material. After orphaned sources have been detected and selected all rest metal material have been accepted on Italian border.

Therefore, Bosnian Foundrymen's Association is also going, before installing of suitable Agency, to collaborate with international bodies such as the International Atomic Energy Agency (IAEA) and representatives of other industrialised countries and Slovenia³) too, to develop domestic radiological screening guidelines and participate in development of international radiological screening guidelines that ensure that castings and steel products will not contain harmful levels of radioactive contaminants. Bosnian Foundrymen's Association adopt the IAEA recommendations and suggests to Bosnian Competent as such. Such metal scrap or materials reach Bosnian borders, but there is no any control. It is possible to conclude on the base of information's from surrounding countries, where is uncontrolled a plenty of hazardous materials. Such materials because of money profits or other reason was during the aggression or later very easy transported in Bosnia and stocked everywhere. There is

possible to happen because of lack of customer control on a large part of Bosnian boundary as a reason of aggression on Bosnia. Some countries intend to install their stocks for radioactive materials just near Bosnian border⁴).

International and domestic standards, rules, norms and regulations, as well as guidelines will be one of protective barriers against potential possibilities for radioactive contamination of metal material.

5.2. Places

Transportation of scrap or metal semifinished or finished products into or out Bosnia can be performed by:

- railway wagons through five border crossings
- road lorries through less than fifty border road crossings, and
- airplanes over five airports border crossings.

Therefore the coverage of control should start from the border or (air) port checkpoint where the flow of the scrap begins to the final castings and steel product. In present after war situation it is very difficult, because of strong political influence in both Bosnian entity. But with suitable education and with optimal operational attitude of Competent Authorities it will be possible to reach such level of control that public protection become good enough. In any case Bosnian Foundrymen's Association, if fail all other measures on state level, will insist that their members control all scrap or metal material input at the entrance of firm for railway wagons or lorries. In

that case it is not important if scrap or metal material is domestic or imported. Only in such case it possible to expect some problems with detected radioactive materials at entrance of firm, how return back such material or where stocked it. It shows that Bosnian Governmental Authorities must be included in from early beginning, because they must secure places for depositing of such radioactive materials or orphaned sources or returning back to exporting countries.

5.3. Equipment and measurement techniques

Equipment and measurement techniques will be the second of protective barriers against potential possibilities for radioactive contamination of metal material. On the base of literature data there are very successful equipment or measuring systems for detection of radioactivity of scrap, orphaned sources or metal materials^{5,6,7,8,9}). Some of them are very effective in detecting even low increases over background radiation, but with some not too important drawbacks. Installed an automatic scrap or orphaned sources

monitors inside of customers areas are suitable for railway wagons or lorries but very often required to keep on with manual monitoring. It made necessary to find more convenient instruments for monitoring or adapted systems. A lot of adopted system are very effective for detection as well as for handling.

6. PREDICTED CONTROL

In the wake of the war, there has been a growing concern over the import of radioactive contaminated metallurgical scrap, semifinish or final steel products or low quality raw materials which are uncontrolled or of unidentified sources. In this regard, it is urgently required to establish an effective system to prevent from, to detect and to control the flow of the radioactive contaminated metallurgical scrap.

In a spite of some connections with foreign organisations there is no any domestic organisation, because of aggression and after war situation, which is working on several approach to solve the problem. Therefore, only Bosnian Foundrymen's Association alone is, now, working on several approach to solve the problem for foundries and Iron and Steel Works in Bosnia.

The Bosnian Foundrymen's Association system should be established in such a way that all sorts of radioactive metallurgical elements should be controlled and prevented from use in all the metallurgical manufacturing processes, ferrous and non-ferrous alike.

The coverage of control should start from the border or (air) port checkpoint where the flow of the scrap begins to the final castings and steel product. The control system should take a form of internationally common and acceptable standards and regulations. Equipment's and measurement techniques should also be internationally common.

Proper examination and meaning about safety culture in terms of relationship between influencing factors as attitudes to safety and perceived organisational commitment to safety have to be as basement for suitable predicted system of safety control. Because of that the individual's attitudes to personal actions for safety do not seem to be influencing their appraisal of the organisation's commitment, suggesting that the locus of existing safety practice is perceived to be outside individual control, or indeed a separate outcome influenced by management actions for safety. It is difficult to suppose that suggested system is the most suitable, because there is no possibility to compare, but if suggest as management actions for safety as a prime area for intervention to improve overall perceived appraisal of commitment to safety.

The utility of this system can be set in the context of particular sectors of foundry and steel manufacturing industry where hierarchical management and state custom structures typically operate and where, in spite

of, management expectations, safety training at all levels is just at the beginning (embryonic) what means that safety culture is not yet developed and present in observed firms of foundry industry. Suggested organisation of control have to fit in sense that individual are without safety culture and that actions of personnel for safety do not relate to perceived organisational commitment

6.1. Control system

The effective system should be established in such a way that all sorts of radioactive metallurgical elements should be controlled and prevented from use in all the metallurgical manufacturing processes, ferrous and non-ferrous alike.

The control system should take a form of internationally common and acceptable standards, rules, regulations as well as on written or unwritten engineering rules to control and handle materials, especially hazards.

In the order to positively shape control system appraisal of commitment to safety, attention has to be paid to management actions as defined in terms of current scale items. This, in turn, seems to argue to that commitment aspects of safety culture are more related to Competent Authority, management systems and procedure than to the more personal and social aspects of these subjective construction. Once again management - related issues are indicated as possible targets for future interventions.

Because of quantities of scrap which have to be charged and as well as metal or non-metal additions, control system have to be based on objective criterion of with minimal subjective influence. So was mentioned two aspect of control system are defined: standardised guidelines, official representatives with instruments and the third aspect are scrap metal recycles with instruments to screen incoming shipments of metals as well as customers controllers with their equipment's. It is especially important to pronounce that scrap metal recycles are responsible because they import and export metal scrap. Such organisation would be easier to organise for captive foundries or steelmill than for alone foundries, especially for smaller. Supervision in that system have to be ordered to Agency for metal scrap with ecological laboratory and movable unit. At the beginning such supervision can be ordered to Bosnian Foundrymen's Association, as example.

Transportation system for scrap metal or semifinish or finish products at large consisted of railway wagons and lorries. A large part of middle and small foundries as well as scrap metal recycles use lorry transportation. Because of large number of Bosnian boundary crossing as well as very porous situation on

it, it is the best solution to perform scrap metal control at the entrance of customers or scrap metal recycles area. Bosnian Foundrymen's Association suggests that type of organisation because of on time manipulation with scrap or metal material and possibilities of returning back. Iron and steel Works is suggested same principal system.

6.2. Control places with official representatives with instruments and recyclers

The coverage of control should start from the border or (air) port domestic or external checkpoint where the flow of the scrap begins to the final castings and steel product. But because of that in Bosnia and Herzegovina there is less than 50 road border crossing places, a few ports and four airports (Sarajevo, Mostar, Banjaluka and Tuzla) it is rather useful to establish more flexible control place system. Not at each road boundary crossing places but only at the 15 largest with manual monitoring with detectors types: SSM-1, TSA systems or at least RADOS. For all other road scrap transportation information for transport have to be sent to Agency in Zenica, which mobile unit can on time control such transport.

At the entrance to users or customers areas have to be installed an automatic portal scrap metal and semiproduct or finish product monitor types: BICRON ASM III or Gamma-Scan RTM 910, M90-VMR Vehicle Mounting Rack, etc.. Each of this systems have to be equipped with one more manual monitoring detectors for more rigid control.

Same equipment must be installed at recyclers.

6.3. Control equipment's and measurement techniques

Above mentioned control equipment's and measurement techniques have to be in accordance with chosen guidance and European or World standards and measuring techniques applied in Italy and Germany. With mentioned very simple transfer instruments (Gieger-Müller detectors, proportional detectors or dosimeter) it is possible easy to measure dose and the dose rate. Measured values must be in accordance with results applied in Italy and Germany. Each transport which radiation of scrap charge or semifinish or finish product overcoming allowed values have to be return back to sender.

7. CONCLUSIONS

1. Findings, consistent with literature data on Competent Authority, management commitment, identify managers as a key group which influence and improve attitudes to satisfy. Personnel actions

for safety is not a direct predictor nor a mediator of other predictions. It can be treated as a separate outcome and not as a part of the mechanism of influence in spite of quality of safety training. This is very important statement in connection with organisation of control and handle of foundry and steelmill scrap, especially hazardous, radioactive scrap or other metal or non-metal additions .

2. Transportation system for scrap metal or semifinish or finish products at large consisted of railway wagons and lorries. A large part of middle and small foundries as well as scrap metal recyclers use lorry transportation. Because of large number of Bosnian boundary crossing as well as very porous situation on it, it is the best solution to perform scrap metal control at the entrance of customers or scrap metal recyclers area and only control on 15 main road crossings and 5 railway border crossing if possible. Bosnian Foundrymen's Association suggests that type of organisation because of on time manipulation with scrap or metal material and possibilities of returning back. Iron and steel Works is suggested same principal system.

3. As there is no Bosnian guidelines and standards Bosnia and Herzegovina has to use international standards as domestic, so that there is enough time to prepare its own standards and normative if it is convenient.

4. Aspect of control system are defined: standardised guidelines, official representatives with instruments and the third aspect are scrap metal recyclers with instruments to screen incoming shipments of metals as well as customers controllers with their equipment's. It is especially important to pronounce that scrap metal recyclers are responsible because they import and export metal scrap. Supervision in that system have to be ordered to Agency for metal scrap with ecological laboratory and movable unit. At the beginning such supervision can be ordered

5. To Bosnian Foundrymen's Association, as example before installing of Agency for metal scrap with ecological laboratory and movable unit .

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