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Foundry Waste Management

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Abstract: *Waste management in foundries is gaining a higher ecological and economical importance. Waste is becoming an increasingly traded product, where excellent profits can be made. Due to the cost reduction and successful business operation in companies, waste has to be regenerated and used again as a material to the maximum possible extent. Such research is long lasting and expensive and is a great challenge for companies.*

In the frame of our research, a total waste management case study for the Slovenian foundry Feniks was carried out. From the sustainable development point of view, waste management is most suitable, since it ensures the material utilization of waste, reduces the consumption of natural renewable or non-renewable resources and makes efficient production capacity utilization possible. Properly treated ecologically safe waste with a suitable physical characteristic, long-term existence, is a substitute for natural materials. Sand, dust, slag and other mineral waste from foundries are increasingly being used as materials in other industries.

The foundry Feniks was awarded with certification of the environmental management system according to the standard SIST EN ISO 14001 and confirmed its environmental credentials.

Keywords: *Ecology, Waste Management, Foundry*

1. INTRODUCTION

Waste management in a testing foundry Feniks d.o.o. includes control, appropriate collecting, manipulation, storage, and removal of the waste, which is produced in casting process. The basic goal of the waste management is to define, and organize individuals, who are responsible for performing of particular procedures on such a way that human health is not in danger and with such methods, which reduce environment pollution to minimum. It is especially important to prevent:

- excessive air, water and soil polluting,
- spreading bad odors and noise,
- substantially deterioration of living conditions, and
- bad influence on environment in the region.

2. TESTING FOUNDRY

In the frame of our research we treat a testing foundry Feniks, which has been operating almost 60 years and for the moment employing 107 workers. Production program of foundry Feniks includes casting of grey iron and nonferrous metals, continuous casting, bell-casting, casting models and match plates making, and other secondary services in casting industry. Grey iron castings are produced in

quantity and mostly designed for metal manufacturing and machine industry. Speciality for foundry is bells manufacturing which are produced in small series or even individually.

The whole production is placed on one place and is located on suburb of the town Žalec. The foundry is divided in to the following four production units:

- meltery,
- casting line,
- refinery and grindery, and
- hand foundry.

Maximum foundry productivity is 1100 tons grey iron melt per month, if work is organized in three shifts. Casting line is designed by Italian company ADRIABATIC, and is totally automatic.

Hand foundry for bronze products has a maximum capacity of 3 tons per month and 12 tons for other nonferrous metals.

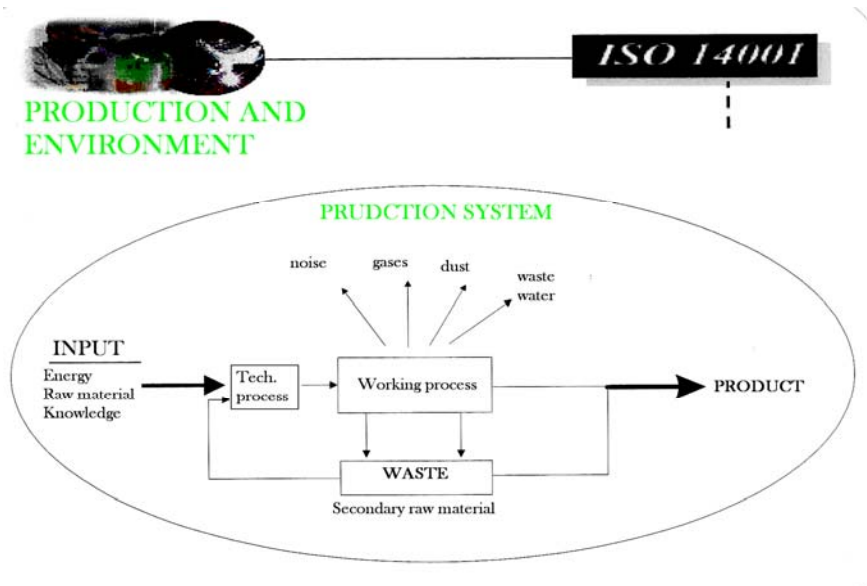

Figure 1. Production process organised according to ISO 14001

Figure 2 - Melting in induction furnace

3. INFLUENCES ON ENVIRONMENT

In the testing foundry, formation of waste and environment pollution by manufacturing processes could be divided into the following groups:

- waste gases emissions,
- waste material emissions,
- emissions of heat into environmental water, and
- noise.

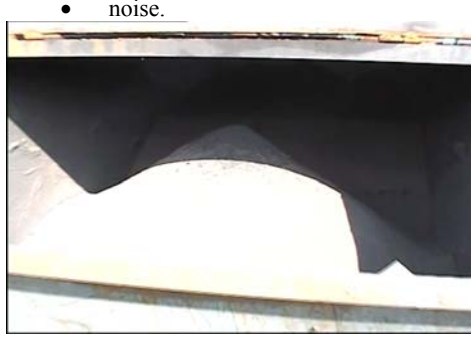

Figure 3a - Waste casting sand and slag

Figure 3b - Waste casting sand and slag

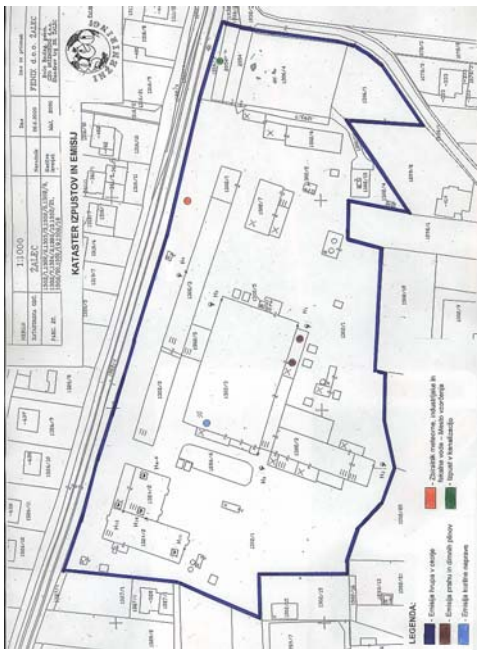

Figure 4 - Cadastral register of material and heat emissions in the water

Foundry management is because characteristic unclean production, which cause different influences on people, atmosphere, water, soil, vegetal and animal world in constant contact with ecological experts and make every effort to minimized those influences.

Table 1 represent applied production and secondary processes in the foundry Feniks.

Table 1 - Applied production and secondary processes in foundry Feniks

Production processes	Secondary processes
Mould sand preparing	Toxic chemicals storage
Sand core manufacturing	Waste material storage
Sand mould manufacturing	Inner transport
Melting and casting iron alloys	Outer transport
Melting and casting nonferrous alloys	Product packing
Refining and grinding of castings	Equipment maintaining
Castings colouring	Management
Machining	Work done by cooperantes
Model making	

After analyzing all the existent and possible causes on environment, is necessary to evaluate them by their consequences on the environment. For this purpose we evaluate them by following criteria: regulations and legislation demands, accordance with environment policy, health safety, extension of influence, probability, seriousness, etc. Influences and criteria are not measured only with word description but also numerically which helps concerning significance of the particular causes for possible polluting and establishing priority scale to abolishing them.

4. WASTE FROM TESTING FOUNDRY

In foundry Feniks waste treatment comprehend three basic procedures:

- separate collecting,
- identification and marking, and
- temporary storage of the waste.

Table 2 - Type and quantity of waste in the testing foundry in the year of 2006

	Waste	Quantity
1	Waste unused casting moulds and cores	13.920 kg
2	Waste used casting moulds and cores	284.500 kg
3	Slag from furnace	6.700 kg
4	Dust from exhaust gases	17.200 kg
5	Other similar waste	17.100 kg
6	Worn out insulating layers and fireproof materials	2.800 kg
7	Waste from sandblasting	8.800 kg
8	Used motor oils, which contain halogens (without emulsions)	300 kg
9	Used motor oils, which doesn't contains halogens (without emulsions)	1.800 kg
10	Used machine emulsion, which contain halogens	400 kg
11	Used machine emulsion, which contain halogens	80 kg
12	Mineral hydraulic oils	1.220 kg
13	Motor and machine oils and lubricant which doesn't contain chlorine	600 kg
14	Paper and carton packing material	3.800 kg
15	Plastic wrapping	1.200 kg
16	Metal wrapping	2.050 kg
17	Packing material with remains of toxic chemicals	4.500 kg
18	Wood wrapping	40 m^3
19	Absorbents, filtration means, cleaning patches, used protective clothes whit remains of toxic chemicals	720 kg
20	Waste paints and lacquers, which contain organic solvents or other toxic agents	190 kg
21	Ni-Cd batteries	30 pieces
22	Other type of batteries	6 pieces
23	Saturated and worn out pitches from ionic exchangers	300 l
24	Iron and nonferrous metal scrap	49.500 kg
25	Cesspit slime	25 m^3
26	Mixed communal waste - garbage	7.200 kg

All waste is separately collected in marked waterproof metal containers at the place of its origin, where is also temporarily stored.

Containers are marked with classification number regarding on type of waste. When the containers are filled, waste is transported to the main waste covered storehouse, which is build as leaking protection reservoir. There are separately storage in specially prepared waterproof and corrosion protective containers until are removed. All procedures are under supervision of foundry control department, who is regularly exercise control over production and waste formation.

5. CONCLUSIONS

Waste management in foundries is gaining a higher ecological and economical importance. Waste is becoming an increasingly traded product, where excellent profits can be made. Due to the cost reduction and successful business operation in companies, waste has to be regenerated and used again as a material to the maximum possible extent.

From the sustainable development point of view, waste management is most suitable since it ensures the material utilization of the waste reduces the consumption of natural renewable or non-renewable resources and makes efficient production capacity utilization possible. Sand, dust, slag and other mineral waste from foundries are increasingly being used as materials in other industries.

In the frame of our research, a total waste management case study for the Slovenian foundry Feniks was carried out. The foundry Feniks was awarded with certification of the environmental management system according to the standard SIST EN ISO 14001 and confirmed its environmental credentials.

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