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ONE VIEW OF A BASE OF THE ENVIRONMENTAL PROTECTION ISSUES TO INDUSTRIAL WASTE TREATMENT MANAGEMENT

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Abstract: *The paper presents the research framework of questions, models and possible solutions that should be taken into account in order to define and establish an integrated system for managing industrial hazardous and inert waste generated in the process of industrial production of facilities-products, processing and techno-metallurgical treatment of materials. Here, a specific case was analyzed regarding the IHP "Prva petoletka" HCO - Trstenik (PPT), in the period when the company operated according to market principles and generated revenues and profits. So, everything has been real here, at the level of perceiving the concrete situation of a company that operates and exists in a real environment. The established ecological policy and ecological goals had been evidenced. Process algorithms are presented with appropriate activities at the level of management of solid hazardous and inert waste, wastewater and management of used oils that represent hazardous waste - a valuable raw material. Reporting of the waste to the Recycling Agency is the significant thing at implementation of waste management in the Republic of Serbia in order to protect the environment and implement the provisions of the Basel Convention in our country. An industrial landfill in a sanitary-utility landfill in Trstenik is a dumped waste that could not be recycled and reused. Waste management in the PPT has been carried out yet as responsibly 25 years ago according to the specifics of the company and the requirements of the legislation. In the meantime, the system has maintained and upgraded in line with observed irregularities and changes in legal acts.*

Keywords: *waste management, hazardous waste, inert waste, solid waste, wastewater, used oils, environmental protection*

1. INTRODUCTION

The management of environmental protection should be taken care responsible and, as a rule, it is necessarily to work preventively. This is our reality and everyday need, but it is also a global problem number one for our entire planet.

The first type of significant environmental pollutants is induced primarily by day-to-day war destruction in various parts of the world. In fires environmental pollutants are appeared also, that occur as a result of contamination of soil, water and air, as well as the uncontrolled dismantling of nuclear waste, which has become an integral component of all powerful installations, missiles and rocket (Nedeljkovic V., Tomic R., 2006).

Another important type of pollutant is technological processes in the production of various products, where the product itself can be a potential pollutant, and the inevitability of every technological process is practically always any kind of unwanted product. With the appropriate ecological treatment within the technological process, from an undesirable product can be obtained an ecologically acceptable and useful secondary product, while by inadequate treatment it can become inert or in the worst case become hazardous waste (Bogojevic I., Nedeljkovic V., Trajcevski V., Tomic R., 2004).

The significant problem from the aspect of environmental protection is the increase in the production of industrial and municipal waste as a result of the rapid development of a significant number of small and medium enterprises, in addition to already existing significant production capacities within large systems (Tomić, R., Radosavljević, M., Jovanović, L., 2015).

The goal is to achieve the growth and improvement of living standards, but in this process it must be manage of appropriate waste, especially hazardous and inert waste. This is a significant segment of the global environmental problem, as well as the problems of sustainable industrial and economic development (Kokanovic, M., Tomic, R., Arsic, M., 2016).

The place and role of the subject program in the business system can be closely considered within the context of global development management in the production company (Tomić, 2003).

Below, appropriate aspects of these issues will be considered at the level of a representative, advanced-oriented business system, such as IHP "Prva petoletka" -Trstenik (period, 1995-2015).

The authors believe that this model (more closely illustrated in the following points and through algorithms) is still viable today, because it has been verified in practice and has been sustained according to adequate dynamic disturbances and tests over a longer period of time (the results are significant and reliable, they supported by appropriate logistics and statistics).

2. BASICS OF ECOLOGICAL POLICY

The quality system of IHP "Prva petoletka" - Trstenik (at the level of the holding and in a number of joint stock companies, this model included nineteen JSC) has been established in accordance with the requirements from the ISO 9001 standard, when the environmental management first introduced as a quality management subsystem, and then developed to

the full extent according to the requirements of the ISO 14001 standard (at the “Integrated Quality and Ecology System” level).

A new organization of the company was adopted and, accordingly, ecological bureaus and departments for secondary raw materials were formed in JSCs. Having in mind the importance of environmental protection in IHP “Prva petoletka”, as well as for city Trstenik, an active, anticipatory and preventive environmental policy has been adopted, without creating an unacceptable risk, ie all in the interests of employees. The policy is expressed through the Statement on Ecological Policy (Bogojevic I., Nedeljkovic V., Trajcevski V., Tomic R., 2004).

In accordance with the document in question, IHP “Prva petoletka” has made appropriate plans and implemented appropriate actions at the level:

- Ecological dimensions represented in enterprise management as determinant of sustainable development;
- Defined sustainable environmental plans and programs that ensure compliance with all existing laws and regulations in the field of environmental protection and inform all employees of the existence and obligatory compliance with all relevant laws;
- Own rules are defined and enforceable applied, documented through procedures and instructions where there are no legal regulations, or where they do not provide adequate protection;
- Rules and obligations to stop the production of any JSC that creates an unacceptable risk to the health and safety of man and / or his environment;
- Defined and implemented programs of saving natural resources and energy, reducing the use of toxic substances and reducing the amount of hazardous waste;
- Establishment, at the enterprise level, of the environmental protection organization with responsibilities for the implementation of environmental policies and goals;
- Implementing the correct environmental policy and accepting responsibility for the work done, with no ecological risk (i.e. with a minimum risk) with continuous improvement of quality and competitiveness, which is further concerned with the motivation and adequate training of each individual in order to achieve optimum results;
- Continuous improvement of the quality of products, services and processes so that environmental impacts are reduced to the minimum in the production, use and different treatments;
- Introduced monitoring by ecological effect (as informing its employees, stakeholders, the public and the competent state authorities).

3. REAL ECOLOGICAL OBJECTIVES

The general environmental objective of IHP “First Five Years” was, as with most large industrial companies, to monitor the strategic goal of the state and its authorities. The basic principles are based on the respect of existing laws, regulations, standards and norms, with the basic goal of achieving profit through estimating of long-term trends in ecology and well-designed and implemented programs for environment protection, reduce pollution and programs at the level of green marketing (Nedeljkovic V., Tomic R., 2006, p. 420).

Realizing these objectives should, as a rule, enable the company to achieve the image of a progressive business system that responsibly solves the problems of preserving the environment and preserving the health and working skills of employees. Environmental goals

were set in relation to the following, according to (Bogojevic I., Nedeljkovic V., Trajcevski V., Tomic R., 2004):

- Minimization of waste as a strategy in which everyone gets (environmental protection society, and a company from the aspect of fulfilling ecological requirements related to processes and products);
- Convenience of the product for ecological disposal and recycling, which helps to get an environmentally appropriate product, which further means that is a possible to get real renewal of resources;
- Reducing the use of resources to the level of optimal consumption;
- Save energy inputs as a long term - a permanent task;
- Development of new products with reliable control and minimization of environmental impacts during production, use and additional processes (i.e. maintenance, reparation etc);
- Promoting environmental awareness within the company and externally.

4. RESPONSIBLE WASTE MANAGEMENT

Waste management involves the control of creation, temporary storage, collection, selection, transshipment, transport, recycling, reuse and final disposal in the most conservative way from the aspect of environmental protection (Nedeljkovic V., Tomic R., 2006, p. 420).

From the set environmental policy and ecological goals, it is clearly seen that the minimization of waste, recycling, saving of natural resources and reduction of adverse environmental impact is a priority activity in the company's ecological plan, and that such programs and projects must be leaded and adequately must be managed.

Waste management is carried out in accordance with the legal regulations and actions that the competent authorities and institutions take care for, while the companies take care of the implementation of laws, standards and regulations. Here are some aspects to this topic, in accordance with:

- The responsibility of the Government of the Republic of Serbia: Implementation of the policy of the Republic of Serbia, implementation of laws, regulations and general acts adopted by the National Assembly;
- Ministry of Environmental Protection: Provides implementation of the system and the basis of protection and improvement of the environment and sustainable use of natural resources; preparation of documents, plans and programs of strategic importance for the country; the management of chemicals hazardous and harmful substances and waste, including the production and marketing of poisons and the cross-border movement of waste; establishment and development of the information system as well as inspection supervision and the like;
- Ministry of Agriculture, Forestry and Water Management: Responsibility for the protection and use of agricultural land, control and innocuous waste removal, control and registration of plant protection products and fertilizers in production. There is also water management policy, multipurpose use of water and water supply, water protection, implementation of water protection measures and planned rationalization of water consumption,

regulation of water regimes, monitoring and maintenance of water regime; forest's policy, etc.;

-Ministry of state administration and local self-government is responsible for the organization and operation of ministries and special organizations, local self-government and territorial autonomy, administrative procedure and administrative dispute, administrative inspection, communal activities, concessions, etc ;

-Of course there are other ministries and agencies with their competencies (Ministry of Health, Ministry of Finance, Recycling Agency, etc.).

The Law on Environmental Protection ("Official Gazette of the Republic of Serbia", No. 66/91, 83/92, 53/93, 67/93, 48/94, 53/95 and 135/04) regulates the protection of nature and the environment, measures and procedures related to the release of pollutants into the air, water and land, defines hazardous, waste and detrimental substances, determines the manner of handling and disposal of waste materials, especially municipal waste and hazardous waste) is basic law in this field. Other documents are very significant also:

- Law on Waste Treatment ("Official Gazette of RS", No. 25/96 and 101/05);
- Rulebook on the criteria for determining the location and regulation of waste dumps ("Official Gazette of RS", No. 54/92 and 30/99);
- Rulebook on the manner of treatment of waste that has the status of dangerous substances ("Official Gazette of RS", No. 12/95 and 56/10);
- Rulebook on the analysis of the impact of facilities or works on the environment ("Official Gazette of the Republic of Serbia", No. 61/92);
- Other compatible legal and secondary legislation, based on which the defined operational documentation is subject to compulsory innovation and updating, in accordance with the predictions and achievements of science, profession and practice (Ilic, 2017).

Of course, EU waste legislation is also inevitable: Council Directive 75/442 / EEC on Waste (Framework Directive). The basis for this Directive is the EU Waste Strategy, Member States are required to establish an integral and adequate network of disposal facilities, taking into account the best available technologies that do not involve excessive waste disposal costs (<http://predmet.singidunum.ac.rs/pluginfile.php/4729/mod>, 2006). Directive 96/61/EEC on Integrated Pollution Prevention and Control is also indispensable.

Member States should develop management plans that take into account, the quantities and origin of waste to be treated or deferred, general technical requirements, all special arrangements for all specific waste, and the appropriate locations and disposal facilities (<http://object.singidunum.ac.rs/pluginfile.php/4729/mod>, 2006).

Companies or institutions that store, treat, or dispose of waste for another person must provide authority from the competent authorities that relates specifically to the types and quantities of waste to be treated, the general technical requirements and precautions to be taken (<http://predmet.singidunum.ac.rs/pluginfile.php/4729/mod>, 2006).

The Directive establishes a framework for waste management in the EU and the hierarchy of waste (prevention or reduction of waste production and its detriment, waste utilization, including recycling, reuse or use of waste as fuel), according to (<http://predmet.singidunum.ac.rs/pluginfile.php/4729/mod>, 2006).

The “polluter pays” principle applies to the disposal of waste to ensure that waste disposal costs is generated by the waste producer or from the owner of the waste that the waste carries on collection or disposal. Data logging and reporting systems must be established for the purpose of obtaining data on the name, address, type and amount of waste to be treated for each plant or system for the disposal of hazardous waste, in particular (<http://predmet.singidunum.ac.rs/pluginfile.php/4729/mod>, 2006).

Initial ecological reconsideration

In the initial ecological review phase, identification of all relevant environmental aspects carried out. As a rule, special attention dedicated to the identification of wastes that occur in the production process and the process of purification of waste galvanic water.

Here is a brief diagram of a part of the general situation in the country and the world about waste. The percentage of distribution of certain types of waste has practically not significant changed over the last ten years.

The average composition of the municipal solid waste in the EU countries is given in Figure 1.

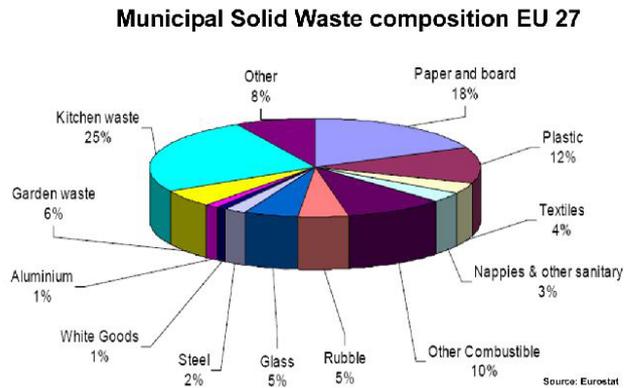


Figure 1. Municipal waste generated in 2016, kg per capita (average composition);
Source (<http://www.wastemantech.com/project-results/itcl-biodegradable-solid-waste/>, 2016)

The percentage composition of waste in USA is given in Figure 2.

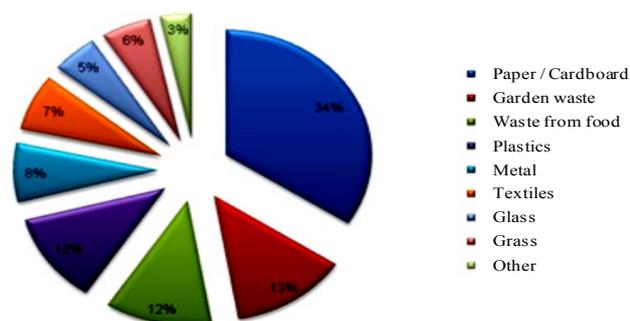


Figure 2. Percentage composition of waste in USA; Source (<http://predmet.singidunum.ac.rs/pluginfile.php/4729/mod>, 2006)

The percentage share of waste components for the city of Belgrade is given in Figure 3.

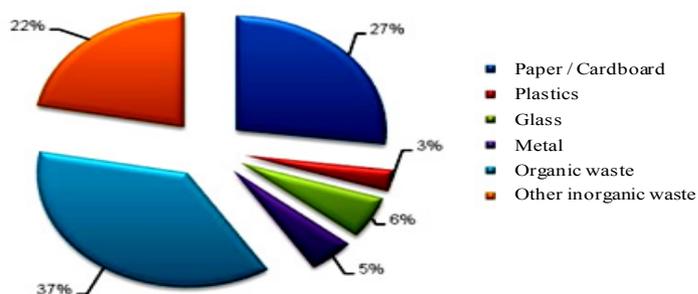


Figure 3. Percentage share of waste components for the city of Belgrade Source (<http://predmet.singidunum.ac.rs/pluginfile.php/4729/mod>, 2006)

Of course, there are many other statistics regarding different types of waste (industrial waste, municipal waste, household waste, etc).

Types of waste that have the largest share in non-hazardous industrial waste can be seen in Figure 4 (Environmental Protection Agency). Enterprises must enter the exact label of waste from the European Waste Catalog.



Figure 4. Types of waste that have the largest share in non-hazardous industrial waste in Serbia (data from 2008) Source: https://www.iswa.org/uploads/tx_iswaknowledgebase/s401.pdf, p. 18.

Types of waste that have the largest share in hazardous industrial waste can be seen in Figure 5 (Environmental Protection Agency).

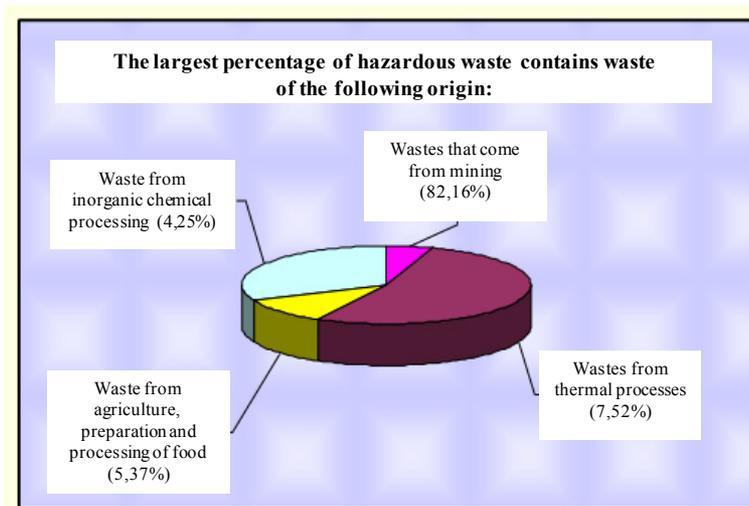


Figure 5. Types of waste that have the largest share in hazardous industrial waste in Serbia (data from 2008) Source: https://www.iswa.org/uploads/tx_iswaknowledgebase/s401.pdf, p. 19.

At company IHP "Prva petoletka" - Trstenik, all important waste streams were carefully studied, so appropriate algorithms of the process of treatment of different waste were

established. For example, for the treatment of wastewater, an algorithm as shown in Figure 6 was established (Nedeljkovic V., Tomic R., 2006, p. 421).

Documentation and records of waste

After completing the identification of waste, in order to approach comprehensive waste management, Solid Waste Management Procedure, Figure 7, and the Process for the Use of Used Oils, Figure 8 are defined (Nedeljkovic V., Tomic R., 2006, pp. 423-424) are defined. Based on the legal regulations, the specifics of production and organization, the procedures define the activities of the work process, primarily who is in charge of the implementation, in what manner, in what timeframe and which responsibility it has in relation to concrete activities. Regarding the management of solid waste treatment, analogous considerations can be considered in work (Tomić, R., Radosavljević, M., Jovanović, L., 2015).

The input documentation of the presented procedures consists of instructions defining the method of selecting solid waste and used oils, the manner of their transportation, storage, recording, reporting, sales, recycling and permanent landfilling.

Output documentation consists of forms (fiches) for reporting generation of waste, reporting of inert and hazardous waste and recording of inert and hazardous waste, defined by the Serbian Recycling Agency. The department of ecology (OC - Secondary Raw Materials) of the joint stock companies, monthly submits the data on waste to the Ecology coordinator, and the coordinator reports this to the Recycling Agency according to the precisely defined terms.

Reports constitute the database of integral waste management system in the Republic of Serbia.

Activities of the work process	Description of the activity	Document(s)	Responsible OU – PPT subsystem or Municipality
	Start		
APW 10	Waste water classification	<i>(Wastewater report)</i>	Production subsystem
APW 20	Separation of waste water and transport to the purification plant	<i>(Wastewater report)</i>	Production subsystem
APW 30	Wastewater Treatment	<i>(Device work diary)</i>	Production subsystem

	Decision: Dropdown of purified water into the reception, depositing of galvanic sludge or return of purified water to the process	In accordance with the type of wastewater, purified water or sludge	APW 40, 70, 80; APW 50; APW 60;
APW 40	Dropdown of purified water into the reception	<i>(Report on deposits)</i>	Production subsystem
APW 50	Deposit of galvanic sludge	<i>(Report on deposits)</i>	Municipal organization
APW 60	Return to the process of purified galvanic water - recirculation	<i>(Device work diary)</i>	Production subsystem
APW 70	Quality control of treated waste galvanic water	<i>(Expert finding)</i>	Quality - subsystem of ecology
APW 80	Reporting	<i>(Expert finding)</i>	Quality - subsystem of ecology
	End		

Figure 6. Algorithm for wastewater treatment activities

This data forms the basis for monitoring the generation of waste in relation to the physical volume of production and reporting to the company's management. This establishes and maintains communication with external and internal stakeholders and evaluates the performance in relation to the set environmental objective (Nedeljkovic V., Tomic R., 2006, p. 424). Of course, there is also a proper responsible and documented action regarding further waste treatment.

5. CONCLUSION

The paper presents the most relevant aspects of environmental orientation and a number of practical issues of interest in solving the problem of waste treatment. The aspects of the legal regulations and obligations and opportunities of the company based on the level of ecological policy, ecological goals, plans and projects of introduction of the environmental management system are emphasized, all as a prerequisite for successful functioning of the company with responsible managing of waste.

The defined procedures should satisfy the current legal regulations and technical and technological capabilities of the company, but also provide the possibility of updating from

the aspect of new laws, instructions and possibilities of introducing innovations (Ilic, 2017). It is necessary to constantly improve them and strive for minimum waste generation and maximal saving of natural resources, to adapt them to modern technical achievements, to improve the legal regulations, and in this regard, to conduct timely education of personnel, direct participants in monitoring and solving of the subject problems (Nedeljkovic V., Tomic R., 2006, p. 424).

Activities of the work process	Description of the activity	Document(s)	Responsible OU – PPT subsystem or Municipality
	Start		
APW 10	Identification of solid waste	<i>(Reports of waste; on the special forms)</i>	Production subsystem
APW 20	Collection and selection of solid waste	<i>(Quantity Report, on the forms)</i>	Production subsystem
APW 21	Internal solid waste treatment	<i>(Report)</i>	Production subsystem
APW 22	Quality control of treated waste	<i>(Expert finding)</i>	Quality - subsystem of ecology
APW 30	Transport of solid waste	<i>(In accordance with the Transport procedure and the Warehousing procedure)</i>	Production subsystem
APW 40	Storage of solid waste	<i>(Volume Report, on the forms)</i>	Production subsystem
APW 50	Records and reporting on solid waste	<i>(Report to the Recycling Agency) + Report to the Board of dir. and CEO;</i>	Quality - subsystem of ecology

	Classification of waste for sale or disposal?	<i>In accordance with the type of waste</i>	APR 60 or APR 70
APW 60	Waste disposal	<i>(Waste Sales Report)</i>	Sales subsystem - delivery of final products
APW 70	Continuous storage of waste	<i>(Report)</i>	Production subsystem
	End		

Figure 7. Activity Algorithm for Solid Waste Treatment

The success in conserving nature and living space can not be achieved only by determining and applying environmental laws, regulations and provisions (especially not only on the level of technological capacities and users of products, i.e. consumers). It should therefore be aware that there is, and at the global level, a very large number of other factors, the impact and cause of the disruption of the functioning of the ecological model and the proper balance. Because of that, the development and implementation of sustainable ecological systems must be managed reliably at all stages and at all levels.

Environmental preservation has no local, regional or state level, that is a global character, so that the preservation of living space in an ecological sense must be carried out in all segments of life and work, permanently and synchronized.

It has to be primarily reduced and eliminated a large number of causes, which in any way had a significant impact on environmental degradation, in order to maintain the natural balance. As pointed out in the introductory part of the article, all the past wars in the history of human existence on our planet, in addition to the loss of human lives, material and other destructions, have the most significant effect on the disturbance of the ecological balance. The desire of economically and militarily superior societies that "peace is governed everywhere in the world" is in fact an attempt to achieve domination, control and management of natural resources and energy resources, which would be used for their own economic development and for the purpose of leading new wars (new wars and new destructions).

Regarding the processes considered, appropriate algorithms are linked to the subject activities at the level of the procedures and instructions, so the management and technological processes for the production of very different goods are further developed. It should be noted that most attention is focused on water management (there is also a fight for control and improvement of water quality).

Activities of the work process	Description of the activity	Document(s)	Responsible OU – PPT subsystem or Municipality
	Start		
APW 10	Selective collection of used oils	<i>(in accordance with legal regulations; Report)</i>	Production subsystem
APW 20	Transportation of used oils	<i>(in accordance with the Procedure for the transport of dangerous substances)</i>	Production subsystem
APW 30	Storage of used oils	<i>(Report)</i>	Production subsystem
APW 40	Evidence of used oils	<i>(Report, on the form)</i>	Quality - subsystem of ecology
	Classification of oils: Are they non-emulsifying or emulsifying oils?	<i>(According to the type of oil, the Sales instructions or the Purification instructions apply)</i>	APR 50 or APR 60, 70
APW 50	Sale of used oils	<i>(Manual/Handbook for Sale; Sales report of oils)</i>	Sales subsystem - delivery of products
APW 60	Purification of emulsifying oils	<i>(Manual/Handbook for Sale; Sales report of oils)</i>	Production subsystem
APW 70	Waste storage	<i>(Report)</i>	Quality - subsystem of ecology
	End		

Figure 8. Algorithm for the treatment of used oils

From the above, it can be seen that the way to solve environmental problems in the world (not just in companies) is focused on defining and adhering to environmental laws, norms and regulations at a global level, where the effect of the expert teams is the most important for achieving and sets things out so that they overcome many evident opposites. Decisions, based on the argued entirely, must be strictly and without exception respected.

Everything presented here, extremely pragmatic and useful can serve different companies and institutions. The goal is to incorporate enterprises into a full-fledged and professional engagement in the general environmental protection and waste management process in the wider area (not just at the company level and the local environment) to achieve obvi-

ously one of the most important social goals. Tasks related to the discussed issues, by their nature, are of a lasting character.

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