

EVALUATION OF SUSTAINABLE INTERACTIONS BETWEEN CUSTOMER AND SUPPLIER: A CASE STUDY IN MACHINING

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Abstract. *This article aims to evaluate the sustainable interaction of machining processes for a manufacturer of cutting tools, for metal-mechanical industry, and its suppliers. The research is characterized as exploratory with a qualitative approach, accomplished through a case study using the method for managing aspects of environmental impacts - GAIA. Data were collected through company visits, with monitoring and verification of their production process, search and document analysis, and questionnaire relating to aspects of the GAIA method. The results show a satisfactory performance of the features observed, although the company provides opportunities for improvement in its production process.*

Keywords: *Sustainability, Supply Chain, Machining*

1. INTRODUCTION

The climate change and biodiversity loss that occurs today, mainly due to lack of environmentally correct practices by many manufacturing industries, has demanded a greater concern for the environment. The lack of sustainable production processes within the entire supply chain, has tarnished the image of some industries and may even lead to loss of market share in regions where these aspects are considered, in some cases, environmental costs too. According to the Organization for Economic Cooperation and Development - OECD (UNEP, 2000, p.1SM-23, apud STAMM, 2003), "environmental protection and economic development are not only compatible but interdependent and are mutually reinforcing".

The industrial development is very important because brings capital, jobs and technical knowledge. On the other hand, the natural and environmental resources, mainly in poor countries (forests, land, water, etc..), are very important to keep the natural features of the environment and are essential to keep the production of conventional goods and services. Considering this approach, a balance between economic development and exploitation of natural resources must exist, which serve to encourage and protect this important relationship. Based on this, an evaluation of the situation, based on a sustainable point of view, of the internal procedures of any company becomes an important tool to measure the actual situation and to help in forwarding actions to contribute to reducing the environmental impacts.

Thus, to contribute with this subject, this article aims to identify the environmental performance of a manufacturer of cutting tools, for metalworking industry, and their respective supply chain.

For this, the method GAIA Management (Environmental Aspects and Impacts) was applied in a company established in Brazil to assess their environmental performance and its suppliers. The information was achieved by interviews and the results allow to conclude that the analyzed company has a satisfactory performance pointed by applied method and that there are opportunities to increase this indicator.

2. INNOVATIVE SUSTAINABLE ORGANIZATIONS

Sustainability, according to Sachs (1990, Apud SICHE, AGOSTINHO, ORTEGA, ROMEIRO, 2007), but it is a dynamic concept that takes into account the growing needs of populations in an ever-expanding international context. For the author, sustainability is based on five main dimensions, which are the social, the economic, the ecological, geographical and cultural.

According to the concepts of sustainability of this movement, innovations must generate economic results, social and environmental impacts at the same time, which is not easy to do, given the uncertainties that innovations bring, especially when they are radical or with a high degree of novelty in the state of the art.

The economic effects are relatively easy to predict as there are a slew of instruments developed for this, and innovative companies know how to use them. The social and environmental effects are more difficult to assess in advance, because they involve many more variables, uncertainties and interactions. So what else can be seen is the continuity of the conventional wisdom accompanied by a discourse that incorporates the theme of sustainable development which is only in good faith, when there is a way of appropriating an idea that is gaining importance for the

population and opinion leaders. Sustainable development requires the combination of technical and social changes, as these are closely related (SCHOT; GEELS, 2008, apud SICHE, AGOSTINHO, ORTEGA, ROMEIRO, 2007).

Innovative organization "is the introduction of any news on a systematic basis and reap the expected results" (BARBIERI, 2007, p. 88, apud BARBIERI, GOUVEIA VASCONCELOS, ANDREASSI, VASCONCELOS, 2010). The expression "systematic basis" means the realization of innovations with autonomy, intentionality and proactivity. Thus, innovation is an essential element of the modus operandi of the organization, which means that it continually develop tangible and intangible resources to innovate continuously. Sustainable organization is one that simultaneously seeks to be economically efficient, respect the carrying capacity of the environment and is an instrument of social justice, promoting social inclusion, protection of minorities and vulnerable groups, the balance between these genres (BARBIERI, 2007, p. 98-99, apud BARBIERI, GOUVEIA VASCONCELOS, ANDREASSI, VASCONCELOS, 2010).

2.1. Case Study in a Company Machining

The machining can be considered one of the most important transformation processes existing in the industry. Most of all manufactured goods in some of its stages of production undergoes some machining process. Its development followed the evolution of various sectors such as manufacturing engineering and product engineering (DINIZ et al, 2006, WHITE, 1998).

A key element of sustainability is the prudent use of natural resources. This means that the use of nonrenewable resources, efficiency and develop alternatives to replace them in the future as the use of renewable resources so as not to impair the resources or cause pollution. The main features of concern in production technologies are:

- metals used in machining processes: In order to maximize the performance of sustainability, materials that are in abundance and has the potential for recycling / reuse without any significant environmental impact must be used. An overview of sustainability factors should be considered when selecting types of material for machining are shown in Figure 1;

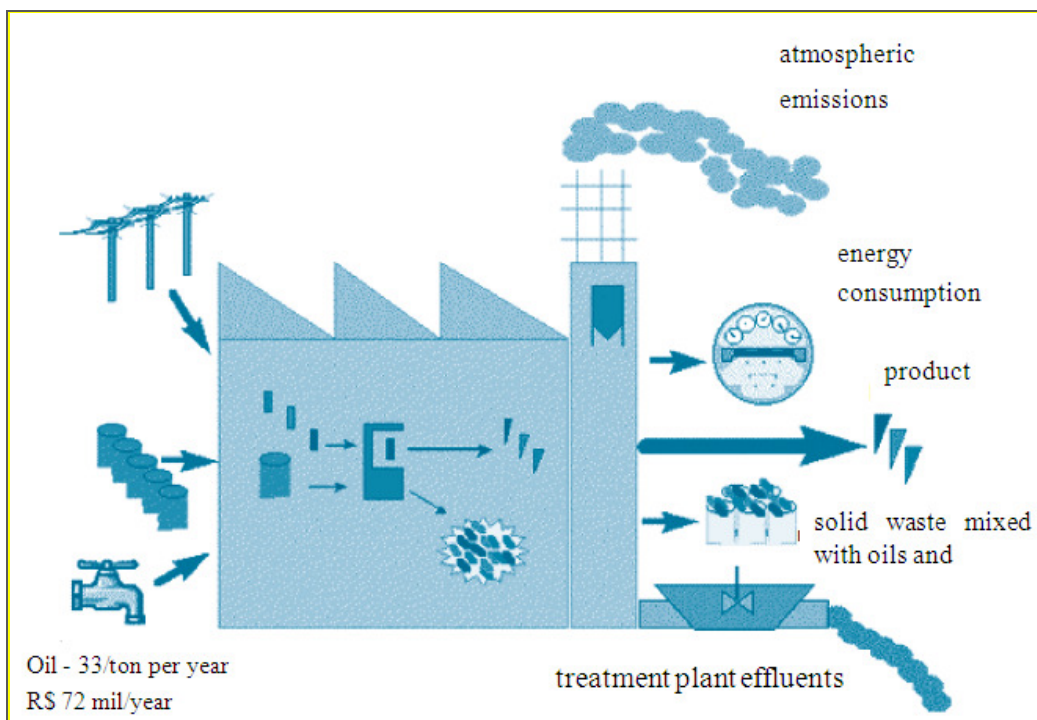


Figure 1. Generation and emission of waste in a typical metalworking industry.
Fonte: CNTL- National Center for Clean Technology.

- cooling / lubricating fluids / oils and hydraulic oils: It is known that the cooling-based liquid oils / grease (CLFS) is one of the most unsustainable of machining processes. Most CLFS and other industrial lubricants are formulated from mineral oils, which are made from oil extracts. CLFS uses biodegradable vegetable-based raw materials that are considered less toxic than formulations based on mineral oil and can offer better working conditions for operators;
- water: Water is one of the easiest ways that industries have to achieve cost savings. There are simple and inexpensive measures to reduce overall water consumption by 50%;

- energy: In machining processes can save money using sustainability, reduce energy consumption. Energy is an essential resource for production. The cost of energy used during a period of ten years is about 100 times larger than the initial acquisition cost of these machine tools. If you can minimize energy use, operating costs are reduced and, on the other hand, the generation of environmental impact of energy (carbon dioxide emissions) is reduced.

According to PUSAVEC et al (2010), production technologies, ways to improve the sustainability performance are:

- reducing energy consumption machining processes;
- minimize waste (generate less waste and increased recycling or waste);
- use resources efficiently;
- use of recycled materials or reuse of machine tool components;
- improving the management of metalworking fluids, cuttings, lubricating oils and hydraulic oils (improving the environment and safety performance of health);
- adopt methods of evaluating the life cycle.

The company studied is a leading global manufacturer of cutting tools for metal-mechanical industry, with over 25,000 products. In 60 countries around the world, thousands of experts working full steam to provide solutions to our customers.

The company has studied various processes in its production, one of them stood out to represent and measure the sustainable interaction, which would be subdivided into two stages: CNC Lathe - To handle w / clip - Diam. 50 x 40 mm length and Machine Center CNC - Machining According Design D2. Where have two types of disposal:

- chip - who is the surplus steel removed during the machining;
- cutting-fluid - which is used to lower the temperature of the friction created a tool that removes material, the liquid is changed, that is from time to time all the fluid is removed from the tank of the machine (which must be discarded) secondly, there is a need for replacement, because it loses the properties and cause odor, and even cause allergies to the operator.

One of the most used in manufacturing in general is machining. The use of cutting fluids in this process is common, due to the improvement in tribological conditions. The use of cutting fluid improves tool life, minimizes heat generation during the process, assists in the removal of chips and generally improves the efficiency of the production system, according to Alvez and Oliveira (2007).

After processing, it has a product that demonstrates the required characteristics in terms of quality, economic efficiency and recyclability. Still, there are the residual materials and emissions, which are unwanted parts. This process was discussed in this article to assess the interaction of the company's sustainability.

2.2. Evaluation of Sustainable Interactions between Customer and Supplier

The twentieth century brought a series of events and changes in various segments of society, which boosted the competitiveness of markets, globalization, fierce competition and also the scarcity of natural resources. Hansen and Mowen (2001, apud LERÍPIO, 2001) cite advances in manufacturing technology and information, the globalization of markets, deregulation and a greater awareness of ethical and environmental business, among other phenomena that sort of forced organizations adapt to a new competitive reality. Considering these aspects, people have become concerned with environmental issues, which had never before been noticed, since natural resources were, according to Silva (2003 apud LERÍPIO, 2001), abundant and free. Accordingly, Andrade, Tachizawa and Carvalho (2000 apud LERÍPIO, 2001) highlights that:

"In light of the requirements of society made by organizations in a position more appropriate and responsible action to minimize the difference between the economic and social as well as ecological concerns, which have gained significant, and compared their survival to quality of life of populations, has required companies to reposition themselves in their interaction with the environment. "Organizations are seeking ways to adapt to this reality, using assessment instruments for environmental performance".

Due to the need to adapt organizations to sustainability, was selected an industry benchmark for measuring environmental performance. It was used in this article, the method GAIA - Management Aspects of Environmental Impacts - idealized by Lerípio (2001), due to its ease of implementation and compliance with the proposed theme.

The method was applied in a leading global manufacturer of cutting tools for metal-mechanical industry. The research is characterized as exploratory, qualitative approach, accomplished through a case study. Data were collected through visiting with monitoring and verification of their production process, search and document analysis, and questionnaire relating to aspects of the GAIA method.

Method GAIA - Managing Environmental Aspects and Impacts, according Lerípio (2001), is a set of instruments and management tools with a focus on environmental performance applicable to the production processes of an organization and in achieving full sustainability. The focus of GAIA is on developing a critical consciousness in people that make up the organization with regard to the levels of wastage of raw materials and inputs in the production process

as well as on the effects produced by the waste effluents and emissions by - both generated in the process - and that are harmful to the environment and people. To Pfitscher (2004, p. 81), "GAIA therefore appears to value companies, organizations and areas of human resources, embedded in them. Values also the consuming public, since, to assess the environmental impact, it acts in society".

This method tries to integrate, through sequential standardized approaches to educating people and improving processes, using such principles to their theoretical and conceptual. The principles of GAIA are identical to the basic assumptions of management recognized by ISO 14001: continuous improvement, pollution prevention and legal compliance.

Thus, the basic principles of GAIA are defined by the following expression: "To provide organizations with legal compliance, continual improvement and prevention of pollution from activities focused on environmental performance and sustainability, taking as fundamental elements of the organization process and people through their relationships with the environment" (LERÍPIO, 2001, p. 66). The GAIA method consists of three phases, in which are subdivided into some activities, as shown in Table 1. This article will focus on phase "awareness", where one can detect the level of sustainability of the company studied.

Table 1. Phase and activities of the GAIA method

STAGES	OBJECTIVE	ACTIVITIES	OUTCOMES
AWARENESS	AMBIENTAL AND PROVIDING THE ACCESSION OF SENIOR MANAGEMENT COMMITMENT TO CONTINUOUS IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE	EVALUATION OF SUSTAINABILITY OF BUSINESS	CURRENT LEVEL OF KNOWLEDGE OF THE ENVIRONMENTAL PERFORMANCE OF THE ORGANIZATION FOR SENIOR MANAGEMENT
		STRATEGIC ENVIRONMENTAL	CURRENT PERFORMANCE COMPARISON WITH THAT SUBMITTED BY DEFENSIVE FOLOSOFIAS, REACTIVE, AND REGARDLESS OF INNOVATIVE MANAGEMENT
		COMMITMENT FROM SENIOR MANAGEMENT	DEFINITION OF MISSION, VISION, POLICY AND ORGANIZATIONAL OBJECTIVES
		AWARENESS PROGRAM FOR STAKEHOLDERS	AWARENESS OF EMPLOYEES, SUPPLIERS, COMMUNITY BOARD ENVIRONMENTAL CUSTOMERS
CONSCIENTIZATION	IDENTIFYING THE 'PRODUCTION AND CONSUMPTION AND ENVIRONMENTAL ISSUES, ESPECIALLY THE PRODUCTION PROCESS OF ORGANIZATION GOAL	MAPPING THE CHAIN OF PRODUCTION AND CONSUMPTION	IDENTIFICATION OF THE CHAIN OF LIFE CYCLE OF THE PRODUCT FROM THE EXTRACTION OF RAW MATERIALS TO THE FINAL DESTINATION OF POST-CONSUMER PRODUCT
		MAPPING THE PROCESS OF macroflows	IDENTIFICATION OF THE STAGES OF THE PRODUCTION PROCESS ORGANIZATION OF TARGET
		STUDY OF INPUT AND OUTPUT PROCESSES	QUALITATIVE IDENTIFICATION OF RAW MATERIALS, SUPPLIES USED, PRODUCTS, WASTE, EFFLUENT AND EMISSION OF EVERY STEP OF THE PROCESS
		INVENTORY OF ASPECTS AND ENVIRONMENTAL IMPACTS	IDENTIFICATION OF KEY ISSUES AND ENVIRONMENTAL IMPACTS OF THE PRODUCTION PROCESS
TRAINING	EMPOWERING THE EMPLOYEES TO DEFINE AND IMPLEMENT IMPROVEMENTS IN ENVIRONMENTAL PERFORMANCE	IDENTIFICATION OF CREATIVE SOLUTIONS	PROPOSED SOLUTIONS FOR KEY ISSUES AND IMPACTS USING BRAINSTORMING
		TECHNICAL FEASIBILITY STUDY AND ENVIRONMENTAL-ECONOMIC	DEFINING WHAT IS THE SOLUTION MORE VIABLE UNDER VIEWS TECHNICAL, ECONOMIC AND ENVIRONMENTAL
		PLANNING	SETTING GOALS AND OBJECTIVES, ACTION PLANS AND PERFORMANCE INDICATORS (5W2H)

Font: Lerípio (2001, p. 68).

In the first phase, "Phase of Awareness", the activity of assessing the sustainability of the business is done by filling out a checklist, presented in Table 2, which should be filled by senior management, managers and company employees.

The responses on the checklist of sustainability of the organization are classified in three colors according to their significance in relation to the sustainability of the organization.

The answer that represent good practice developed is classified as green, the response to represent a problem or an "opportunity for improvement" is classified as red, and when the question does not apply to the reality of the organization, it will be classified as yellow. The 79 questions are equally weighted, as the following formula:

- Environmental Performance = $\frac{\text{Total green frames} \times 100}{(\text{No full frame} - \text{No yellow frames})}$

Table 2 - Summary of the Checklist of sustainability of the organization.

Checklist of Sustainability of The Organization	
Evaluation Criteria	Description
CRITERIA 1 - SUPPLIERS	Questions about the sustainable impact the supplier's processes of buyer
CRITERIA 2 - PRODUCTION PROCESS	How does the process of manufacturing the product, what are the technologies used, what steps do you use non-renewable resources and impacting the environment, works with the process of disposing of waste that the company produces, there are human resources are involved if there is encouragement and financial returns for environmental protection in its processes. After consumption of the product, check for a process traceability and returned for reuse, among other things.
a) ECO-EFFICIENCY OF THE PRODUCTION PROCESS	
b) LEVEL OF TECHNOLOGY USED IN THE PROCESS	
c) ENVIRONMENTAL ASPECTS AND IMPACTS OF THE PROCESS	
d) MANAGEMENT INDICATORS	
e) HUMAN RESOURCES IN THE ORGANIZATION	
f) AVAILABILITY OF CAPITAL	
CRITERIA 3 - USE OF PRODUCT / SERVICE	
CRITERIA 4 - POST-CONSUMER PRODUCT	

Font: Lerípio (2001, p. 70-72) adapted.

According to the criteria contained in Table 2 are applied in the company 79 questions to assess the sustainable interaction of the studied company and its suppliers. From the result of calculating the environmental performance, detects the sustainability of the business, as ranked in Table 3.

Table 3 - Classification of business sustainability

RESULT	SUSTAINABILITY	
LESS THAN 30%		CRITICAL - RED
BETWEEN 30 AND 40%		BAD - ORANGE
BETWEEN 50 AND 60%		RIGHT - YELLOW
BETWEEN 70 AND 80%		GOOD - BLUE
OVER 90%		EXCELLENT - GREEN

Font: Lerípio (2001, p. 73).

Depending on the identification of the level of sustainability of the business, the organization is to establish some important relationships, which is made in the strategic environmental analysis. This analysis can be done from the criterion of compliance with applicable environmental legislation. This activity helps top management to "see" in a systemic and Multicriteria real situation of the organization or unit under review. If that idea is understood, the involvement of senior management will be achieved, enabling the effective beginning of the process of change in the organization.

2.3. Results of applying the Evaluation of Sustainable Interactions between customer and supplier

In this research, sustainable interaction was assessed by a large machine tool company and its suppliers, that is, the sustainable interaction between customer and supplier, the prevailing view of the client company, because it pulls sector demand and production machine tools.

The company studied selected and appointed an official authorized to answer the questionnaire, based on the GAIA method, it now has professional contact with the company's suppliers, bringing reliability.

Table 4 shows, in detail, the responses of the studied company.

Table 4 – Detail of the Checklist of sustainability of the organization.

Checklist of sustainability of the organization				
CRITÉRIO 1 – FORNECEDORES OPTION 1 - SUPPLIERS	YES	NO	NA	OBSERVAÇÕES NOTES
1. The raw materials used are from renewable resources?	1			Powder for the manufacture of raw material is recycled from the chip itself
2. Suppliers are monopolistic market?		1		Suppliers are developed according to the needs of the organization and pre-established criteria
3. The suppliers have processes impacting the environment and humans?	1			Vendors that ranked as "direct" are evaluated by a technical visit to focus on quality, environment, health and safety. Conforme questionário padrão As standard questionnaire
4. For the extraction / transport / processing / distribution of raw materials require great energy?	1			
5. The organization's main suppliers are certified by ISO 14001 environmental standards?	1			
6. The main suppliers are certified by the organization's health and safety standards BS 8800 or OHSAS 18001?		1		But suppliers and partners that have been evaluated have received these guidelines

CRITÉRIO 2 – PROCESSO PRODUTIVO OPTION 2 - PRODUCTION PROCESS	YES	NO	NA	NOTES
a) ECO-EFFICIENCY OF THE PRODUCTION PROCESS				
7. The production processes are polluting or potentially polluting?	1			Are potentially polluting, but there are operational controls in place to minimize / eliminate any pollution, such as filters, containment boxes, effluent treatment plant
8. Occurs the generation of hazardous waste during processing of the product?	1			Used oil - recycling, empty containers of chemicals - recovery, layer with oil - reprocessing
9. The production process is responsible for a high consumption of energy?	1			But in a development study for energy savings through supplier subcontracted
10. The conversion rate of raw materials into products is greater than or equal to the industry average?	1			Like the conversion rate of raw material
11. The relationship effluent generated per unit of output is equal to or greater than the industry average in cubic meters of water per unit produced?	1			Equal
12. The relationship between solid waste generated per unit of output is equal to or greater than the industry average in kilograms of solid waste generated per unit of product produced?	1			Equal
13. The relationship between air emissions generated per unit of output is equal to or greater than the industry average product produced in meters ³ cúbicos (ou quilogramas) de emissões atmosféricas por unidade de produto produzido? cubic (or kilograms) of air emissions per unit of product produced?		1		For production of special tools no atmospheric emissions
14. The relative energy used per unit of output is equal to or greater than the industry average in gigajoules per lot (or unit) of product produced?	1			Equal
15. The organization fully meets the standards relating to health and safety of employees, internal and external	1			OHSAS 18001
b) LEVEL OF TECHNOLOGY USED IN THE PROCESS				
16. The products produced have a low value?		1		
17. The technology provides viable only for large-scale operation?		1		
18. The technology features a high degree of complexity?	1			There's trade secrets regarding the production process
19. The technology features high automation (requires a low density of capital and labor)?		1		One operator per machine
20. The technology requires the use of inputs and raw materials hazardous?	1			Refrigerant oil
21. The technology requires the use of nonrenewable resources?		1		
22. The technology is indigenous (able to be developed, maintained and improved their own funds)?	1			
23. The technology represents a dependency of the organization in relation to a supplier or partner?		1		

c) ENVIRONMENTAL ASPECTS AND IMPACTS IN THE PROCESS	YES	NO	NA	NOTES
24. The water source used is a Community?	1			Sabesp
25. There is a high water consumption in the production process?	1	1		For the manufacture of tools
26. There is a high consumption of water in the organization?	1			For cooling process
27. Is there any type of water reuse in the process?	1			Treatment plant effluent
28. Hazardous waste are generated during the process?		1		
29. The legal standards related to wastewater are fully met?	1			
30. Hazardous solid waste are generated (Class 1) during the production process?	1			oils
31. The legal standards relating to solid waste are fully met?	1			
32. Is there some kind of recycling of solid waste in the process?		1		In the process no, but yes for recycling
33. Is there any waste generated subject to recovery in other processes?	1			Oil, plastic, scrap metal
34. The matrix is energy from renewable sources?		1		
35. The productive activity is high consumer of energy?	1			
36. It occurs to generate toxic or hazardous air emissions?		1		
37. The legal standards relating to air emissions are fully met?			1	
38. Is there some kind of reuse of energy in the process?	1			Solar energy for power showers
39. Greenhouse gases are used in the production process?		1		
40. Ozone gas is used in the production process?		1		
41. Elements are used which cause acidification in the production process?		1		
42. Volatile organic compounds are used in the production process?		1		

d) MANAGEMENT INDICATORS	YES	NO	NA	NOTES
43. The organization is subject to intense supervision by the municipal environmental agencies, state and federal?	1			Cetesb, Civil
44. The organization is a defendant in a lawsuit related to environmental pollution, environmental accidents and / or workers' compensation?		1		
45. There have already been complaints about aspects and impacts of the production process by the neighboring community?		1		
46. If so, have taken corrective actions and / or preventive actions to resolve the problem?			1	
47. Accidents or environmental incidents have occurred in the past?		1		
48. If so, accidents or incidents were resolved according to the expectations of stakeholders?			1	
49. Accidents or incidents were documented and recorded in the appropriate way?			1	
50. They are made systematic investments in environmental protection?	1			Box for collecting rainwater, effluent treatment station, solar heating for showers
51. The efficiency of utilization of inputs and raw materials is less than the industry average?	1			Equal
52. The monthly amount of raw materials and energy used per unit of product is growing?		1		Always kept the same kw / pcs

e) HUMAN RESOURCES IN THE ORGANIZATION	YES	NO	NA	NOTES
53. Top management is committed to effectively shows the environmental management?	1			
54. The management team that has really committed to environmental stewardship?	1			
55. The manpower employed is highly specialized?	1			
56. Employees are directed to technological innovations?	1			
57. Creativity is one of the strengths of the organization and its employees?	1			
58. There is a policy of valuing intellectual capital?	1			
59. The organization offers profit sharing or other forms of motivation for employees?	1			
60. The newly developed products have long development cycles?	1			Annually more than 1000 products released

f) AVAILABILITY OF CAPITAL	YES	NO	NA	NOTES
61. There is capital available for investments in environmental management?	1			
62. There are legal restrictions or registration for the granting of loans for investment in environmental management?		1		
63. The organization has operating profit in line waste management?		1		

OPTION 3 - USE OF PRODUCT / SERVICE	YES	NO	NA	NOTES
64. The traditional consumer product has a high level of awareness and enlightenment environment?	1			Product return program with organization carbide for recycling as a way
65. The product is hazardous or requires attention and care on your part?		1		Because the product is applicable to the machining process where there are people qualified to use
66. The use of the product causes an impact or potential risk to the environment and humans?	1			Human hazard if used incorrectly cut
67. The product is located in a highly competitive market?	1			
68. The product has substitutes in the market or in development?	1			
69. The product is intensive (the first article of necessity)?		1		
70. The product features high durability?	1			
71. The product is easy to repair to increase the useful life?		1		We have not made the process of regrinding because our product offering has a long shelf life compared to competitors
72. The product has a minimum of packaging?	1			Product code on the packaging and traceability, catalogs information about application, performance etc.

CRITERION 4 - POST CONSUMER	YES	NO	NA	NOTES
73. The product, after use, can be reused or reclaimed?	1			Return for Sandvik to return as a feedstock for the process
74. The product, after use, can be disassembled for recycling and / or reuse?	1			Only carbide
75. The product, after use, can be recycled in whole or in part?	1			Only carbide
76. The product, after its use, provides ease of biodegradation and decay?		1		Produto em aço e metal duro Product in steel and carbide
77. The post consumer presents danger?		1		
78. The post consumer requires additional care to protect the environment?	1			Do not dump in nature, long degradation
79. The post-consumed product generates jobs and income in society?	1			Recycling process of metal duct

RESULT	SUSTENTABILIDADE SUSTAINABILITY		
LESS THAN 30%			CRITICAL - RED
BETWEEN 30 AND 50%			BAD - ORANGE
BETWEEN 50 AND 70%			RIGHT - YELLOW
BETWEEN 70 AND 90%			GOOD - BLUE
OVER 90%			EXCELLENT - GREEN
	SUM OF ITEMS		
	20	7	4
	27	21	

Font: Lerípio (2001, p. 70-72) – Adapted.

According to the questionnaire in the company, it was verified that the company and its vendors have a satisfactory result, according to the formula of the GAIA method (LERÍPIO, 2001) applied below:

$$EnvironmentPerformance = \frac{TotalGreenFrames \cdot 100}{NoFullFrame - NoYellowFrame} = \frac{48 \cdot 100}{79 - 4} = \frac{4.800}{75} = 64\%$$

The result obtained by the company was satisfactory due to have reached 64% level of sustainability, considered by GAIA methodology as "adequate" Responding correspondingly given that the studied company is certified ISO 14001 since 2003. In addition, there is Supplier Evaluation - where partner companies are evaluated before their environmental management, quality, and health and safety. Studied where the company requires its suppliers to have a satisfactory rating. This assessment is often performed and used in selecting suppliers.

It is clear that the methodology demonstrates the reality of the company with reference to sustainability, because the result is compared with the production process and also by the company to have ISO 14001 certification.

The production processes of the company and its suppliers are impacting the environment and humans, the extraction / transport / processing / distribution of raw material has great need of energy consumption, production processes are polluting or potentially polluting, occurs at hazardous waste generation during processing of the product. These characteristics make it difficult for the company has a high level of sustainability, given the complexity of their production processes. For that the company needs a consultancy and manpower highly qualified to provide for other ways to produce your product and capture inputs.

3. CONCLUSION

The environmental problem, which has grown considerably each year, increases the problems of disposal and stricter legislation requiring more industries to delve into issues of environmental compatibility of their products. With growing legislative and civil charges on the relationship and industry environment, firms are not allowed to continue with the old technologies, or just to treat or recycle wastes and emissions generated, you should try to reduce or eliminate the them.

Based on the results it is possible to conclude:

- the methodology was adequate to evaluate the performance of the company's environmental practices and assessed their relationship with their suppliers;
- the score (64%) obtained by the company is adequate – based on GAIA methodology;
- although of their good practices, there is space (about 36%) to the analyzed company increase its performance, which is not an easy task, once that company works with very complex processes.

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5. RESPONSIBILITY NOTICE

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