



THE ROLE OF RE-USE IN REDUCING INDUSTRIAL COSTS. A CASE STUDY IN THE GENERAL COMPANY FOR ELECTRICAL INDUSTRIES, IN DIYALA, IRAQ

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Abstract

This study analyzes the impact of reusing of some industrial parts to reduce costs at a company in Iraq. In the research, the company's records and quantity data were collected and analyzed about the reused parts from a factory of electrical transformers. Secondly, a comparison was made between the cost of making new parts and used parts that the company returned it. The results of study were referred to the yield achieved, when the company reuses the used parts. The study also provides some of the conclusions and recommendations including reuse of parts that could be used in the manufacture of products without affecting the quality of product.

Keywords

waste management, reuse programs, industrial costs, cost reduction, Iraq

1. Introduction

In today's competitive industrial environment, industrial companies all over the world shall face massive challenges. It is not a secret, that industrial companies are more competitive than ever, because of the globalization and the new technologies that affect all aspects of today's business environment, especially in the companies of the industrial sector. Besides globalization and the continuous

technological development, the environmental aspects also became important factor of the economy. Nowadays, the reuse of products and components become the matter which cannot be avoided.

Industrial companies are struggling to get competitive advantage and this goal can be achieved through discovering new and creative methods in manufacturing of products with less cost, and providing appropriate means and materials in order to offer the best products which characterized by quality and appropriate cost. The idea of this study comes from this point. Therefore, the study tries to investigate the role of reuse in the reduction of industrial costs in the General Company for Electrical Industries, in Diyala, Iraq.

2. Concepts of reuse

When reusing materials instead of creating new products from virgin materials, there is less burden on the economy and the environment. Reuse is an economical way for people of all socio-economic circles to acquire the items they need. From business furniture to household items, from cars to appliances, and many more devices it is less expensive to buy used than new.

In 1994, the Ricoh Group, a Japanese multinational imaging and electronics company, established the Comet Circle as the basis to encourage towards sustainability (Figure 1). The Comet Circle describes an environmental impact reduction scheme, which includes not only the scope of the Ricoh Group as a manufacturer and sales company, but also the entire lifecycle of their products.

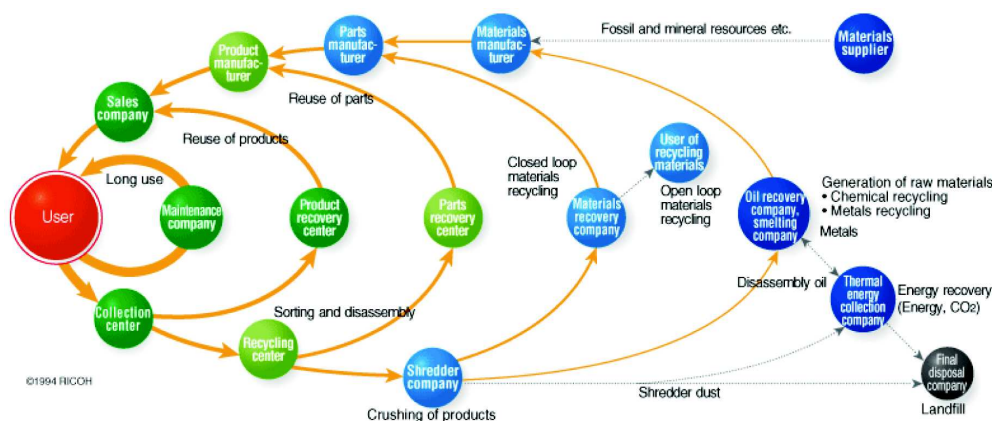


Figure 1. Concept of a Sustainable Society: The Comet Circle™ [1]

Each circle in Figure 1. represents the company's partners that can help develop a sustainable society. The new resources which are taken by the materials supplier from the natural environment (right at the top) will be turned into a product through moving from right to left along the upper route, finally reaching the users, i.e. customers. The used products will follow the route which can be seen in the lines below from left to right.

The concept illustrated by Figure 1 expresses the whole chain of resources. The green circles in the middle and the right side of the figure (product manufacturer, sales company, maintenance company, collection centre, product recovery centre, parts recovery centre, recycling centre are those parts of the chain which are evaluated in the present study.

Besides the reduction of the environmental impacts which will have direct and indirect external effects (on the natural environment and the society) the economic impacts may also be evaluated. The economic impacts are measurable in money terms at company level.

The information of the Comet Circle may be interpreted from other aspects as well. It is also important to recognize that the sustainable growth in reuse efforts, as well as the sustainable interest of the reuse industry, derives mostly from the solid waste reduction hierarchy [2]. Reduce, reuse, recycle, recover and dispose may be illustrated as a hierarchy as well (Figure 2.).

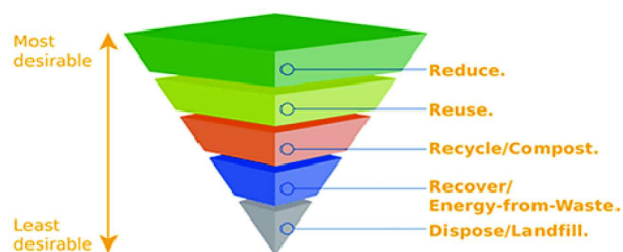


Figure 2. The hierarchy of recovery options [3]

The term “Reuse” can be defined as any operation by which products or components that are not waste, are used again for the same purpose for which they were conceived. To prepare different items for reuse means to conduct some checking, cleaning or repairing recovery operations on them, by which those products or components of products that might have become waste. These items are in such condition so that they can be reused without any other pre-processing [4].

Other literature sources [5, 6, 7] concluded similarly, in the system of waste management energy and raw materials from the environment are used in all production systems. From the production system in addition to the products, emissions, including solid waste, leave the system and enter the environment. If we use less raw materials, and reuse the relevant items, the amount waste that leaves the system at the end, may be much less.

It is very important to reduce waste and costs by using such manufacture products, which may be used many times or can be recycled to reduce its environmental effect as well as achieving financial benefits and production of new sources of revenue for communities [7]. Of course, the reusability of components will depend on several factors such as the degree of generality, complexity, and fit to expected use, as well as the quality of the component.

In addition – as it was already mentioned through the Comet Circle – the component has to be available [8], and it should be highlighted that there are many benefits for reuse of products and components which represent not only economic benefits but also environmental and community benefits. Reuse achieves savings in the cost of purchase materials or new products, and also reduces the amount of waste generated, as well as it requires little efforts [9].

3. Methodology

The methodology of this study depends on the resources and previous studies introduced in the previous, theoretical part of the study, while the practical part will be covered through analyzing and explaining the collected data from the records of the company under research.

Hypothesis

The main hypothesis of the present research is the following: the re-use of the used parts leads to reduce of industrial costs.

Data and sampling

The companies are the most crucial sources to enhance industrial research and provide researchers with important data to calculate industrial costs and working to study it. For the analyses conducted by this study, the General Company for Electrical Industries, in Diyala, Iraq was chosen as a population, because it is one of the Iraqi companies which returns used components and tries to reduce industrial costs under the current competition.

The study analyses the electrical transformer factory. The research focused on the main parts needed for manufacturing the electrical transformer KVA 11/ 250 (tank, core, cover, coil) which can be reused more than one time.

The company returns the reused parts in accordance with the contract with Directorates of Electricity in the country which gives financial discounts for each returned parts if it valid to use. The discount is based on the real manufacturing cost for each part, as illustrated in the Table 1.

Table 1. Discount percentage of different parts

Name of parts	Discount percentage
Tank	5%
Cover	2%
Core	1%
Coil	6%

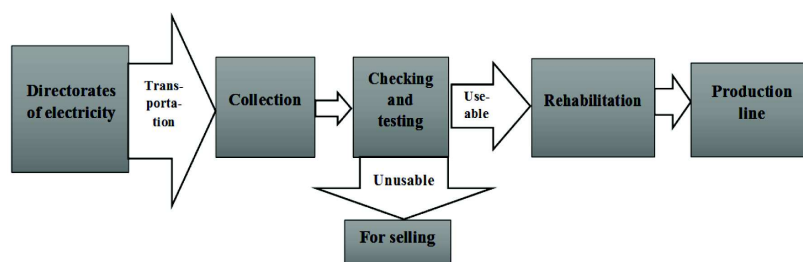


Figure 3. Processes of product return in the General Company for Electrical Industries- Diyala

After the return of used parts, the company works to inspect the parts to ensure its validity then a rehabilitation stage will appear. It means that, if necessary, some cleaning or dyeing processes should be inserted before entering back to the production line to assemble a new product. These processes are illustrated by Figure 3.

Data collection

The data were collected from records of the electrical transformer for the years 2013 and 2014, about the main parts to manufacture of electrical transformers (tank, core, cover, coil). The data were provided by the company from the relevant financial records.

4. Economic evaluation of reuse

This part includes explaining the hypothesis and data of study. The results of the calculations are summarized in Table 2. The first column represents the four main parts which may be reused. In the columns of costs the different real costs and the discounts were given in accordance with the data introduced in Table 1. The approximate costs of rehabilitation and transportation represent those costs which may appear during the rehabilitation process of the used industrial parts.

Table 2. The realized savings by USD\$ from the reuse of parts in the General Company for Electrical Industries Diyala, for 2013 and 2014

Type of parts	Year	Costs					Savings		
		Approx. real cost for manufacturing new part	Discount % for used parts	Cost of Discount	Approx. cost of re-habilitation and transportation	Total cost for used parts	Realized savings for each part	The number of returned parts	Total savings for each part
Tank	2013	333	5%	16,65	24	40,65	292,35	89	26 019,15
	2014	333	5%	16,65	24	40,65	292,35	101	29 527,35
Cover	2013	167	2%	3,34	32	35,34	131,66	152	20 012,32
	2014	167	2%	3,34	32	35,34	131,66	236	31 071,76
Core	2013	417	1%	12,51	21	33,51	383,49	134	51 387,66
	2014	417	1%	12,51	21	33,51	383,49	122	46 785,78
Coil	2013	800	6%	48	35	83	717	114	81 738,00
	2014	800	6%	48	35	83	717	92	65 964,00
Total savings for 2013									179 157,13
Total savings for 2014									173 348,89

The company works on returning the used parts from the directorates of electricity and give a discount for each returned part that depend on manufacturing cost of the new part. The cost of discount is a very low if we compare it with the manufacturing cost of part as shown above in Table 2. For example, manufacturing cost of the transformer tank 11/250 KVA is 333\$, while the cost of the discount 16,65\$ plus cost of rehabilitation and transportation 24\$. In this case, total cost become 40,65\$. Therefore, the realized savings for each tank = 333\$ – 40,65\$ = 292,35\$.

Table (2) above explains the costs of the parts and savings for each part for two years 2013, 2014. The calculation of the realized savings for each part as follows:

$$\begin{aligned} \text{Realized savings for each part} = \\ = \text{Real cost of manufacturing new part} - \\ - \text{Total cost for used part.} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Total cost for used parts} = \\ = \text{Cost of Discount} + \\ + \text{Cost of rehabilitation and transportation.} \end{aligned} \quad (2)$$

$$\begin{aligned} \text{Cost of Discount} = \\ = \text{Real cost for manufacturing new part} \times \\ \times \text{Discount percentage for used part.} \end{aligned} \quad (3)$$

We can note from the results of Table 2, that the rate of savings was different in the different years, for the different industrial parts (which may be resulted by the different conditions of the items or the different processes they were in use etc.), nevertheless, the trends show the worth of reuse in money terms as well.

5. Conclusion

The complexities of our times and high competitiveness in business environment have significant impacts on the organizations in general and industrial organizations in particular. The business companies of the industrial sector shall face many requirements, rules and regulations in connection with environmental protection, which they must adapt into their present processes. In addition, they shall face the turbulent changes in the technology and also in the economic environment. Organizations – especially those who are working in industrial sector – are looking for the necessary and modern mechanisms in order to reduce their industrial costs. A rational planning of reuse of relevant industrial parts or devices used in the production process may help to keep the balance between the environmental requirements, technical-technological development and business success. These three pillars should be built into the planning of manufacturing processes of each industrial companies.

The results of our research give some insights into these aspects. Based on the experiences of an electric company in Iraq, our data analysis indicated that significant savings might be achieved through reusing of used parts. At the same time savings in time could be detected due to the necessary efforts and quick work, and, in addition, energy savings and savings of raw materials can also be detected. All these benefits will work to enhance sustainability and protection of environment.

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