Economics and Management
ISSN:2683-1325
Volume: XXI, Issue:2, Year:2024, pp.48-67
DOI: 10.37708/em.swu.v21i2.4

WASTE MANAGEMENT STRATEGIES IN ENERGY COMPANIES, THE TRANSITION TO A CIRCULAR ECONOMY IN ALGERIA

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Received: 04.07.2024, Accepted: 10.10.2024

Abstract

The concept of the circular economy appeared as an alternative model to the linear model, to preserve natural resources and protect the environment. Waste is at the heart of the circular economy. Companies need to develop comprehensive action plans that incorporate a circular business model to ensure effective waste management and environmental protection. These plans should address treatment and disposal strategies. NAFTAL-PLG, a company in the field of butane and propane gas marketing in Algeria has deployed waste management (gas cylinders) inclusive in cooperation with other waste recovery companies to promote the new circular economy model and participate in environmental protection with strict strategies applicable to all its structures nationwide.

Keywords*: circular economy; waste management; business ecosystem; NAFTAL-PLG; Algeria.*

JEL Codes: O14; L23; L95, M11

Introduction

The linear economy, as it is represented today, is based on a process of wealth creation based on the conversion of natural resources into waste after manufacture and consumption. This classic model, in which goods are produced, used and then thrown away, has negative consequences for the environment and depletes resources.

The issue of natural resources and the environment has been an integral part of economic policy since the publication of the Meadows report in 1972 entitled 'The Limits to Growth', which highlighted the consequences of economic development on limited natural resources and the limited capacity of the biosphere to assimilate the quantity of waste thrown away.

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Beyond the conceptual framework, the circular economy has emerged and gained momentum in recent times, and it has received particular and growing attention from economic actors and public authorities.The management of waste presents a significant challenge that demands effective solutions, particularly in terms of treatment and disposal.

Energy companies, which are a key player in the national economy, are seeking to participate in actions introduced by the public authorities to improve environmental performance with positive economic impacts for them. They must put in place organisational and operational strategies to manage their waste, which is a major challenge requiring cooperation and coordination with other economic actors in order to participate in the deployment of an appropriate, so-called 'circular economic model', with a radical transition from the current model.

In this new economic model, waste is seen as a resource with a value, and companies in the energy sector play an important role in ensuring the supply of energy with efficient management of their waste.

The evolution of the status of waste requires innovative methods in terms of waste management strategies and the economic model to be adopted has given rise to the following question:

What waste management strategies can energy companies deploy to make the transition to a circular economy in Algeria? This question raised several other questions: How does environmental policy influence the waste management strategies adopted? What are the waste management methods used by the energy company NAFTAL-GPL?

To answer these questions, we proposed two hypotheses to affirm or confirm and these are:

Hypothesis 1: The government has implemented regulations to encourage energy companies like NAFTAL-LPG to adopt a circular economy model for waste management.

Hypothesis 2: The waste management strategies applied in NAFTAL-GPL have a positive impact on environmental and economic performance.

The aim of this study is to shed light on the importance of waste management for companies in strategic sectors such as energy. There are many benefits to be gained from implementing effective waste management strategies for the environment and a transition to a sustainable economic model.

This work is in two parts, the first is devoted to a general presentation of the concept of the circular economy, and the second - to innovative waste management methods for a real transition to the circular economy, with a case study of NAFTAL-GPL, a butane and propane gas marketing company in Algeria.

The Circular Economy.

The emerging circular economy

Le Moigne (2014, p. 39) summarised the history of the emergence of the circular economy as follows:

In 1966, the economist Kenneth E. Boulding compared the Earth, which had limited resources, to a spaceship, and proposed setting up a 'closed economy', in which the Earth became an isolated spaceship, so as not to have to extract it or pollute it.

From 1970 onwards, with the Meadows report by the Club of Rome in 1972, the issue was the sustainability of economic activity in the face of ecological degradation, but the analysis of the economic system itself stood the trial of time, given the current modes of production and consumption (Cacheux, 2015, p. 21), taking into consideration the increasing scarcity of resources and environmental degradation.

In 1976, Stahel, in his report 'the potential for substituting manpower for energy', proposed implementing a 'loop economy' to reduce energy consumption and create jobs. Producers are encouraged to close the loop by reverse recycling, substituting energy for labour, and redefining new processes for refurbishment.

In 1989, Frosch and Gallopoulos, in an article entitled 'Strategies for Manufacturing', introduced the concept of industrial ecology, in which the industrial ecosystem functions like a natural ecosystem. Waste from one industry becomes raw material for other industries in order to preserve natural resources and reduce energy consumption, they specified that an ideal ecosystem is to change the usual production and consumption towards the closed approach. (Frosch & Gallopoulos, 1989).

In 1989, in the article 'Economics of nature resources and the environment', David W. Pearce and R. Kerry Turner converted the linear system (extract - manufacture - reject) into a circular system. It was in this article that the term 'circular economy' first appeared.

An approach that analysed the life cycle of products from extraction to end of life, cradle to cradle, developed by William McDonough and Michael Braungart, was published in 2002 (Cradle to Cradle: Remaking The Way We Make Things). According to them, the life cycle analysis of technical and biological products seeks to produce an eco-efficient product that has less negative impact on the environment and is more beneficial to the producer (Le Moigne, 2014, p. 168).

Indeed, there has not been a standardised definition of the circular economy since the concept emerged, (Kirchherr, Reike & Hekkert, 2017) compiled a collection of 114 definitions of the circular economy. Its results show that the circular economy is most often described as a combination of reduce, reuse and recycle activities. According to ADEME, the circular economy is an economic model based on an analysis of the life

cycle of products (goods or services) with the aim of increasing the efficiency of resource use and reducing the impact on the environment, while at the same time improving people's well-being, to decouple the consumption of resources from the country's economic growth, all for the satisfaction of individual desires. (ADEME, 2013)

The Ellen MacArthur Foundation defines the Circular Economy as: “A circular economy is an industrial system that is restorative or regenerative by intention and design”. It replaces the ‘end-of-life’ concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, and systems for maximum efficiency. **(**Ellen MacArthur Foundation, 2013)

The two most widely used definitions in the academic literature indicate that the circular economy is an alternative model to the linear model that analyses the life cycle of products in order to improve people’s well-being, preserve the environment and reduce the use of natural resources.

Circular Economy Areas

The circular economy is based on a host of technological innovations aimed at efficient waste management and clean energy production, as well as organisational innovations such as industrial and regional ecology strategies, extending the life of products and responsible purchasing by consumers. (Bourdin & Torre, 2023) The circular economy is based on three main areas of action: supply from economic actors, demand and consumer behaviour, and waste management, for which recycling is essential.

Figure no. 1 The principales of the circular economy (3 areas, 7 pillars)

Source: Héry, M., & Malenfer, M. (2020). Development of a circular economy and evolution of working conditions and occupational risks — a strategic foresight study. *European Journal of Futures Research*, 8(8), 1-10. https://doi.org/10.1186/s40309-020-00168-7

The Circular Economy: A Systemic Approach

The notion of 'global systems' was introduced by the biologist Karl Ludwig Von Bertalanffy, who developed the idea. It was disseminated in an article entitled 'General systems theory' in 1968; general systems theory was based on interdisciplinarity.

He aimed to generalize the principles of biological synergy so they could be applied to all systems or organizations. The principle of this theory is the interaction between the main players involved in creating value in a dynamic environment for a common goal.

According to Bertalanffy, organisms, in their relationship and the interaction between the components that are part of them, are considered to be living biological systems (Bertalanffy, 1972).

The aim of systematic thinking is to offer the possibility of secure, judicious solutions that are both sustainable and parallel to the development of projects and businesses (Moayyad & Alkhatib, 2020). It is also a well-integrated approach to thinking, learning and innovative analysis to address the potential consequences.

The case of the circular economy appears in the relations between manufacturers which takes part in the lengthening of the life cycle of goods and services and the interaction with the behaviour of the purchasers with their responsible purchases and consumptions in order to take part in the protection of the environment, reducing the costs associated with producing or consuming goods and services.

Industrial ecology

Industrial metabolism is the study of all the biophysical components of an industrial system. This process, which is essentially analytical and descriptive, aims to understand the dynamics of materials and energy flows and stocks linked to human activities, from the extraction and production of resources to their inevitable return, sooner or later, to biogeochemical processes.

Industrial ecology aims to go a step further: drawing on knowledge of ecosystems and the biosphere, it seeks to identify the transformations that can make the industrial system compatible with the 'normal' functioning of biological ecosystems. The study of industrial metabolism is therefore an essential prerequisite for industrial ecology. (Erkman, 2004).

Industrial ecology or industrial symbiosis is defined as '*distinct entities in a collective approach aiming to benefit from a competitive advantage involving the physical exchange of materials, energy, water and by-products*'. Companies work together in the form of communities, with waste from one company becoming a source of production for others at the same stage (Diemer & Dierickx, 2022).

Industrial Ecology can be implemented on three levels: intra-company (within the company itself), inter-company (between different companies) and at a territorial level.

Boiral&Kabongo (2004) point out that the deployment of industrial ecology requires changes in industrial transformation processes, as well as technological innovation, particularly organisational innovation, which is essential for transforming and recovering the waste generated.

Business ecosystem and innovation

The circular model must be deployed at a spatial level, with cooperation between companies in a business ecosystem, which is defined by (Moore, 1993, p. 76) cited by (Daidj, 2011, p. 111) "in a business ecosystem, companies coevolve capabilities around a new innovation: they work co-operatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations". The success of a business ecosystem is based on the characteristics of the actors: they belong to different sectors of activity, are heterogeneous and the logic of competition is based on competitive dynamics to form a community of strategic destiny.

Moore (2006) states that the business ecosystem is a key public good which, like the idea of a business ecosystem and the identification of a space, is at the core of a plan for how contributions in the proposed system will be modularised and how these activities favour sharing between them as a cluster, and what type of company will supply what element, while the intensity will be on companies that become sophisticated in developing green strategies. A strong business ecosystem requires a robust foundation of technology, design, and well-defined partnerships.

Successful cooperation between companies or industries requires environmental innovation, as indicated (Debref, 2018, p. 50-51), where he identifies two types of innovation, one eco-innovation, resulting in a reduction in environmental impact, and the other - concerning the production method or process, marketing and organisational methods.

The OECD defines innovation more precisely in terms of the environment in its report 'Eco-innovation in industry, enabling green growth' (OECD, 2010) as: 'the production, assimilation or exploitation of a novelty in products, production processes, services or business management methods, which aims, through its life cycle, to prevent or significantly reduce environmental risks, pollution and other negative impacts of the resource and its use (including energy)'.

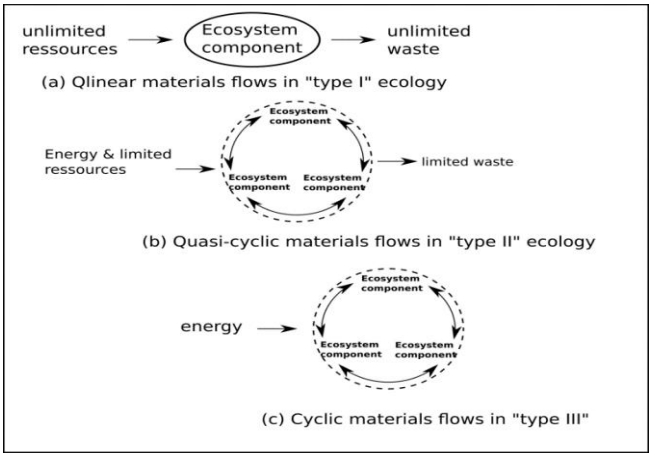
The interest in changing the production and consumption paradigm (World Trade Center Algiers WTCA & Réseau algérien d'Economie circulaire, 2022) argues in favour of modernising industrial sectors to ensure greater sustainability of activity, which

emphasised the redeployment of company activities for a transition to a circular economy, that is based on new forms of cooperation between actors, and is a driver of innovation, competitiveness for businesses and job creation. This is the subject of the 1st International Conference on Companies as Key Players in the Circular Economy, that was held in Oran, Algeria, on 5 and 6 October 2022, through close collaboration between large Algerian companies and circular economy experts, new waste prevention strategies are being implemented, including the adoption of circular business models that prioritize product functionality.

Open innovation can drive the development of regional clusters, providing a platform for organizations to collaborate and co-create innovative solutions (Galiulina & Touate ,2023).

Debref (2018, p. 63-64) distinguishes three types of industrial ecosystem according to their openness to the environment: type 1, where waste can be disposed of without limits; type 2, where the semi-closed material and energy flow circuit allows materials to be partially recovered; type 3, called industrial ecology in a closed system, allows materials that require only one energy source to be looped. Figure no 2.

Figure no.2 Industrial ecosystem typology



Source: Debref, R. (2018). *Innovation environnementale et écoconception certitudes et controverses.* London: ISTE, p.64

The circular business model (economy of functionality)

The functional economy shifts the focus from product ownership to service provision. This paradigm shift was pioneered by (Stahel, 2012), when the company

promotes to preserve resources and retain ownership of product and extend the lifespan without producing waste whose integration into processing is essential.

A circular business model can be a powerful tool for innovation. By focusing on product functionality and considering the entire product lifecycle, companies can develop new business models that are more sustainable and profitable (Mosangini & Tunçer, n.d), This model has the capacity to offer an environmental improvement as well as a competitive advantage for the company attracting customers.

Waste Management Strategies

Global waste management concept

Article 03 of Law no. 2001-19 of 12 December 2001 on the management, control and elimination of waste defines waste as 'any residue of a production, transformation or use process, and more generally any substance, product or movable asset which the owner or holder discards, plans to discard or is obliged to discard or eliminate' (Algeria. 2001, December 12).

The increase in the use of resources has been accompanied by an increase in waste and emissions - this is the linear mode of production. The effective model that analyses the waste hierarchy starts with the production of waste and its management up to the point of zero waste production. This is the waste prevention stage (Weghmann, 2023) (Figure no 3), which requires innovation and new technology with an efficient business model.

Figure no. 3 The waste hierarchy

Source: Weghmann, V. (2023). Waste management in Europe. *Public Service International Research Unit.*, p.11, https://www.epsu.org/sites/default/files/article/files/Waste%20Management%20in%20Europe_EN.pdf

Article 02 of Law 01-19 of 12 December 2001 (LAW 19, 2001) sets out the procedures for waste treatment and management as follows:

- preventing and reducing waste at source;
- organising the sorting, collection, transport and treatment of waste;
- recovering energy or organic waste by reuse, recycling and re-utilization methods.

Waste as resource

The field of action, waste management, corresponds directly to the curative approach, usually described by ecological economists as 'end of pipe' (Erkman, 2004, pp. 101-102), where he explains that waste is seen as a raw material to be exploited by companies and public authorities.

The implementation of the various plans in the field, in terms of environmental protection and remarkable growth, must adopt a change in the economic model towards a sustainable economy known as the circular economy. In Algeria, what the government is advocating is better production, better consumption, better waste management, improved quality of the environment and more responsible economic growth. This is the circular economy that should become the national economy.

Turning waste into secondary raw materials can have a big impact on the economy. We need to invest in new technologies to do this and support local businesses that can process waste (Adel & Guendouz, 2023).

Management of industrial waste

Effective waste management requires close collaboration between governments, producers, and citizens. Government incentive programs and public awareness campaigns can significantly reduce waste and promote recycling. Producers must commit to designing more sustainable products, reducing packaging, and implementing safe waste management procedures. This comprehensive approach will not only protect the environment but also create new economic opportunities through a circular economy (Tietenber & Lewis, 2013, p. 333).

In effect, Waste management is not only a pressing environmental issue but also a considerable economic burden. It demands substantial investments in infrastructure for collection, sorting, and treatment. The costs associated with recycling, energy recovery, and waste disposal are frequently passed on to consumers in the form of taxes or surcharges, or are funded by public authorities.

Potentially recycled waste falls into two categories;

1. First-hand recyclable waste from the transformation and production process, or waste that does not leave the factory and remains under the control of the manufacturer who is responsible for both the production of the goods and the management of the waste. It would be advantageous to set up operations that guarantee the homogeneity of the waste and limit the steps required for recycling. All this reasoning indicates that the primary waste market is working efficiently.

2. Second-hand recyclable waste for consumer use; or the operation of the market is inefficient, as consumers do not pay the costs of collecting, transporting, recycling or disposing of waste, only to have the products (Tom Tietenber & Lynne Lewis, 2013, pp. 318-319). Therefore, the role of the government comes for an integrated waste management, for the purpose of environmental prevention and public health, with marginal costs subsidized from the state.

According to a report produced by the National Waste Agency (Agence Nationale des Déchets /AND/, 2020) for the year 2020, Algeria's population has grown and the country's consumption patterns have become more dynamic, which is leading to an increase in the quantity and nature of the waste generated, and as a result of profound changes in lifestyles and eating habits, the composition of household waste has also changed. The organic waste fraction accounts for the lion's share at 53.61%, followed by plastics at 15.31%. Ferrous metals are more sought after they are recovered directly at source - 1.71% in 2018/2019 while the rate recorded in 2014 was 2.84%. This diversity of waste types makes waste treatment difficult.

Waste recovery in Algeria is remarkably behind schedule at 9.83% compared to the annual production of 13.5 billion tonnes in 2020. Algeria has a major loss for the national economy in terms of diversification of financial income and supply of resources, as well as the creation of new activities that generate jobs and improve the health of citizens, as specified by the Ministry of Water Resources and the Environment (MREE, 2017), as part of the National Environment and Sustainable Development Strategies. If the Ministry of the Environment and Renewable Energy (MEER, 2022) implements the national integrated waste management strategy SNGID-2035, Algeria's urban centers are gearing up to adopt advanced waste collection and processing systems. By introducing selective sorting to separate organic, paper, glass, and other materials, the country aims to maximize the value of its waste and convert it into raw materials for new products

The MEER project, co-financed by the European Union, will enable Algeria to develop better integrated waste management in order to contribute to the development of the green and circular economy and reduce environmental pollution. The projected recovery rate in 2035 was 18.31%, reflecting the pace of development of waste recovery processes.

Algerian cities will have a more efficient and effective waste collection and treatment system. The selective sorting of waste, by separating organic flows, paper and cardboard, glass and other materials, will enable the government and the private sector to recover them and convert them into secondary raw materials for industry, according to the review of actions carried out by MEER 2021-2022.

Waste Management in The Oil and Gas Industry

As part of sustainable development, waste management policies in energy companies (gas and oil) should be based on the principles of the circular economy; the R (reduce, reuse and recycle) to support the profitability of materials (Shahbaz et al., 2023).

There may be impacts on the environment and human health during the extraction of hydrocarbons and gas, as well as physical impacts (oil sludge). All the potential impacts of the routine operations of these oil and gas companies must be taken into account when designing local or regional management strategies.

Case studies

NAFTAL is a joint stock company, with share capital of 160,000,000,000.00 DZD. Founded in 1982, NAFTAL is a wholly-owned subsidiary of the Sonatrach Group. Its main mission is the distribution and marketing of petroleum products and derivatives on the national market.

LPG sector: LPG refers to LIQUEFIED PETROLEUM GASES. They are mixtures of Butane (C4) and Propane (C3). LPGs can be obtained from various hydrocarbon processing sources, such as:

Processing of natural gas or associated gases;

Oil refining;

Liquefaction of natural gas.

Within the LPG product range, NAFTAL markets two key products:

Commercial Butane

Mixture of hydrocarbons consisting mainly of butane and butene and in low proportion of propane and propene (less than 19% by volume). Butane is marketed in two forms of

Bottle of 13 Kg (B13).

Bottle of 06 Kg (B6).

Bottle of 03 Kg (B3).

Commercial Propane

A mixture of hydrocarbons made up of at least 93% propane and propene and the remainder ethane, ethylene, butane and butene.

Packaged propane is sold exclusively in 35 kg cylinders.

The main activity of the CHLEF LPG filling centre is the storage, packaging and distribution of cylinders of various capacities (B03, B06, B13, P11 and P35) and Sirghaz.

Results and discussion

Concrete research can use a mixed methodological approach, combining various data collection instruments and having both quantitative data and qualitative data available for analysis.

The information gathered is processed quantitatively using descriptive statistical analysis and explanatory statistical analysis. Qualitative information is collected and processed by documentary analysis or content analysis (N'DA, 2015). An interview was carried out with the analysis of internal documents as data to be exploited for our case studies, using floating reading (Bardin, 2013) to analyse the company's internal documents on waste management and monitoring.

Discourse analysis studies oral or written textual production within the framework of an internal analysis of documents. It considers writing and reading as the ideal place for observing the development of social meaning (Sabourin, 2003).

The theories produced by qualitative research are not part of the grand theory, the search for universal laws, but rather the notion of mechanism. It involves understanding, in a context or situation, what types of commitments, sequences and mechanisms are at work and account for the behaviour of actors (Dumez, 2011).

Environmental protection and waste management at NAFTAL-LPG

NAFTAL-LPG has a strategy for managing their waste as part of environmental protection, including the application of regulations in force deployed in Algeria.

NAFTAL-LPG's waste management plan involves five key phases;

Phase 1: Understanding waste and waste management

This phase is essential for improving waste management. It enables:

1-identifying the different types of waste and the processes that generate them, making an inventory of existing disposal channels and storage methods;

2-to monitor and analyse the quantities and management costs of waste produced;

3-to identify the most costly waste and the waste produced in the greatest quantities;

4-drawing up an inventory and identify areas for improvement, highlighting weaknesses and strengths.

Phase 2: Understanding waste legislation

Regulatory framework applied at NAFTAL-LPG

Law no. 2001-19 of 27 Ramadhan 1422 corresponding to 12 December 2001 on waste management, control and disposal, art 03

Waste: any residue of a production, transformation or use process, and more generally any substance, product or movable asset whose owner or holder discards it, intends to discard it, or is obliged to discard or dispose of it.

Waste holder: any natural or legal person who holds waste.

Waste management: any operation relating to the collection, sorting, transport, storage, recovery and disposal of waste, including the monitoring of these operations.

Executive Decree No. 2006-104 of 29 Moharram 1427 corresponding to 28 February 2006 establishing the nomenclature of waste, including hazardous special waste.

Executive Decree No. 04-409 of 2 Dhou El Kaada 1425 corresponding to 14 December 2004 laying down the conditions for transporting hazardous special waste

Law 03-10 art 3 the principle of preventive action and correction, as a priority at source, of environmental damage, using the best available techniques, at an economically acceptable cost and which requires any person whose activities are likely to have a significant detrimental effect on the environment, before acting, to take into consideration the interests of others.

Art. 5 - The environmental management tools consist of:

- an organisation of environmental information;
- a definition of environmental standards;
- planning of environmental actions carried out by the State;
- a system for assessing the environmental impact of development projects;
- a definition of specific legal regimes and control bodies;
- the involvement of individuals and associations in environmental protection.

Phase 3: Identifying weaknesses and actions to be implemented

On the basis of the information collected in phases I and II (waste management inventory), it will be possible to identify the weaknesses:

-any regulatory non-compliance (already in phase II);

-the potential for reducing waste at source;

-sources of recoverable waste not currently sorted;

-possible improvements in terms of management;

-shortcomings in terms of staff participation and buy-in, and a list of possible actions to be implemented to remedy the problems identified.

Prevention means adopting eco-responsible behaviour and attitudes, so as to reduce management costs and also the company's environmental impact by reducing the quantity and harmfulness of certain types of waste at source.

Waste prevention means taking action at all levels:

-the manufacture of products by applying eco-design principles that also include the rational use of resources (water, energy, materials, etc.);

-the consumption of products by applying a responsible purchasing policy (eco-consumption);

-good waste management means controlling each type of waste from production to disposal,

improved management involves the application of curative measures to optimising sorting, selective collection, recycling rates, choice of disposal/treatment methods, etc.

Phase 4: Drawing up an action plan

The action plan must take account of the weaknesses identified in phase III.

For each area of progress identified (legislation, prevention, management and staff awareness/adherence), operational objectives will be defined and translated into actions.

Phase 5: Evaluating the actions taken

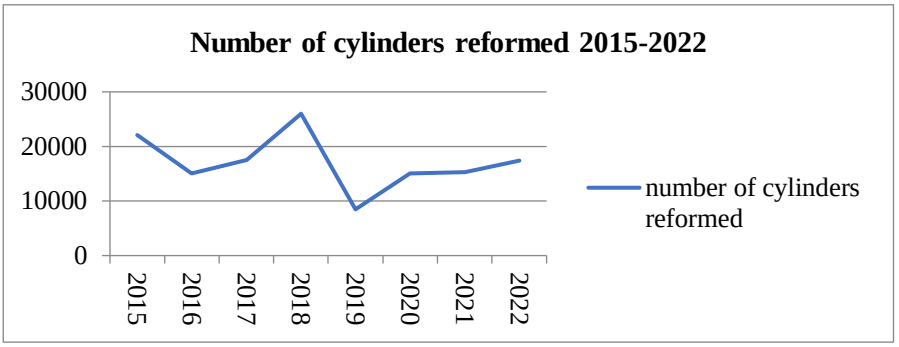
This phase will make it possible to quantify (by setting up indicators) and qualify the results of the actions and to visualise the improvements actually made to waste management.

Methods for Managing Reformed Gas Cylinders

Reformed gas cylinders are classified as special waste at NAFTAL in LPG. In order to manage this type of waste efficiently, it has put in place strategies that correspond to environmental performance in order to guarantee the company's supply of butane and propane gas cylinders with a contract with BAG, which produces and repairs different types of cylinders, as well as a contract with ENR (national recovery company), which buys ferrous waste (gas cylinders) and non-ferrous waste (cylinder locks).

Before putting the cylinders at the end of their life NAFTAL LPG proceeded and applied principles of reuse with the operation of filling the gas cylinders for the marketing of gas as energy to ordinary or professional customers, After the gas consumption, the gas cylinders are checked before being filled again, otherwise they will be reconditioned and considered as waste causing environmental damage, It must be subject to a special management of collection, sorting, transport and recovery or elimination for a positive impact on the environment and the financial state of the company.

Graph no. 1 Number of gas cylinders at end of life



Source: prepared by the authors

As shown in graph 01, the number of recycled gas cylinders constitutes ferrous waste, with a large quantity destined for sale to companies specialising in recycled ENR representing financial flows for NAFTAL-PLG, stored under very specific conditions with labelling indicating the dangerousness in order to protect individuals as well as participating in the protection of the environment.

Table no. 1 –Pillars of the circular economy applied within the company

Pillars d'CE	Apply
Eco-design	Integrating the rational use of resources (water, energy, materials, etc.)
Functional economy	/
Industrial ecology and territory	Sale of ferrous and non-ferrous scrap to ENR, which transforms it into raw materials for other industries nationwide Supply of gas cylinders and valve accessories by BAG (gas cylinder companies)
Reduction	Reducing costs
Reuse	Reusing gas cylinders by refilling them several times
Repair	Repair of bottle valves
Recycling	Collecting and transporting ferrous and non-ferrous waste, sorting and separating it from other waste, as well as storing gas cylinders in appropriate conditions.

Source: prepared by the authors

Only one pillar of the circular economy - the economy of functionality - is not deployed in NAFTAL-PLG, because the product itself that serves the customer is energy, and the nature of the main activity is the marketing of energy products.

The Transition to The Circular Model

The sale of recycled gas cylinders as ferrous waste to the national recovery company (ENR) under a cooperation contract creates an industrial ecology for the recovery of end-of-life products, or the outputs after treatment become raw material resources for other industries.

NAFTAL-PLG promotes the protection of the environment or the conditions of collection and transport of waste according to the regulations, the places of treatment, of storage of waste, subjected to the standards of the prevention of the individuals.

In fact, NAFTAL-PLG has deployed integrated waste management strategies with the aim of reducing the costs of purchasing new products in order to guarantee economic gains with less environmental impact as well as impacts for human health and to guarantee the satisfaction of its customers, in addition to the supply of energy in LPG material available with efficiency.

NAFTAL-LPG focuses on environmental performance with the adaptation of effective and rigorous waste management strategies to reduce burdens, which reduces dependence on resources, with these strategies promoting synergy with other industries, their waste becomes resources, without compromising internal supply the company builds an industrial ecology. This has created new economic opportunities, Transforming the linear mechanism into a sustainable, long-term model for companies working together in a territory as a waste exchange network, this mechanism was an environmental innovation for energy companies practising with the principles of the circular economy, with the emergence of a new circular business model focusing on the environmental impact of the activity of energy companies and economic development including the preservation of natural resources at the same time.

Conclusion

The transition to a circular economy has multiple benefits: for the environment, it reduces the risks associated with economic activity, in particular to protect individuals; for the economy, it reduces costs in the face of dwindling resources and increases company profiles, including customer satisfaction, with a circular business model that focuses on organisational and operational innovation.

NAFTAL-PLG branch has deployed effective waste management strategies with a circular business model based on the principles of R (recycling, recovery, reuse, etc.) and

integrated the ecological aspect into the business of marketing butane and propane gas using eco-design, in order to preserve the environment and reduce carbon emissions.

For environmental and economic performance, NAFTAL-PLG has joined forces with other companies to repair and recycle gas cylinders in a cooperative business ecosystem, where the cylinders that are reformed after treatment will be raw materials for other industries in an open circuit.

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