

Report

An Interdisciplinary Project on the History of Plastics in Portugal^[1]

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Abstract: This work aims to investigate aspects of the history of plastics in Portugal and document how these materials are related to social, economic, cultural, artistic, industrial, energetic and environmental trends, in order to better understand the contemporary material world, by establishing a national plastics museum collection.

Keywords: *Plastics history, materials history, material culture, conservation, preservation, plastics, entrepreneurship, museum of plastics, Portugal.*

Introduction

Plastics influence everyday life in the most diverse forms and functions. Even detractors of plastics who consider them synonymous with the artificiality of society, use them constantly. In general the public does not see plastics as a special class of materials, maybe because they are only associated with cheap and easily accessible mass-produced objects.

However, plastics owe much to a long-standing history of scientific and technological research: they are polymeric man-made materials, the result of the intensive research of generations of scientists and technicians. To produce

polymeric materials, one can establish a set of desirable properties and, within certain limits, realise them by means of polymer science. This requires immense creative efforts, whether from the chemist, physicist, the engineer or the designer, in a field that is ever more open to exploring new materials and improving existing ones.

Furthermore, plastics are materials of immense value with respect to the history of science and technology, society, art and design.^{2-5]} They and their precursors had and still have a tremendous influence on our general cultural history and presence, being part of our materials

heritage.

Last but not least, they might undergo degradation due to the physical, chemical, mechanical or biological deterioration of their constituent materials. In Portugal, synthetic polymers preservation and conservation is a very new field of activity. Based on this knowledge, we hope the project described here will act as a starting point for the understanding of the importance of preserving plastics and contribute to a recognition of the historical significance of polymers in museums.

The Project

The interdisciplinary project described here, already financed by the Portuguese Agency for Science and Technology (Fundação para a Ciência e Tecnologia), aims to explore aspects of the history of plastics in Portugal, on the basis of technical-scientific, industrial, and social-historical studies, as well as on the history of material culture. It is undertaken by a team of experienced experts, i.e. researchers in the following fields: history of science and technology, social history, anthropology, industrial archaeology, museology and chemistry, and sociology.

The project intends to perform a full history of plastics, in order to elucidate: the techno-scientific aspects of plastics (and their communication to the general public); the need to preserve plastic objects; the role of plastics in the development of industrial design, not just as corporate strategy but also in everyday life; the relationship of the plastics industry with their industrial stakeholders (local workers and management) and other industries (electrical and glass) as well as energy and environmental issues related to plastics. We plan to set up a museum, to carry out studies on conservation, historical, technological and scientific research into plastics.

One of the purposes of this project is

to study the impact of plastics on Portuguese society. The beginnings of the industrial production of Bakelite (the first synthetic plastic) in the mid-1930's, in an agricultural country largely without capacities for chemical research and technology nor an industrial tradition to speak of, mark a transition to modernity in Portugal vis-à-vis to the more advanced industrial nations where plastics had already gained acceptance. 'Baquelite Liz' (cf. figure 1, 2), a company located in Leiria in central Portugal, started plastics production in 1940. Our intent is to carry out tasks such as the surveying and cataloguing of its estate and manufacturing methods, in addition to its impact on the social and cultural life of the region, and expand this work to other similar businesses. Leiria seems the ideal place to start this investigation because it was the birthplace of the plastics manufacturing industry.^[6,7] Moreover it represents a great opportunity for establishing a space to safeguard the memory of plastics, especially considering the trend towards decentralisation, where a future museum could realistically be established.

Evaluation of the state of preservation of historical plastic objects in Portugal

After World War II, many plastic objects gradually disappeared. So it would be interesting to catalogue them through institutions, businesses and/or private organisations, interested and engaged in their preservation/conservation.

Because some plastics are vulnerable to degradation, we aim to evaluate the chemical and physical conditions of selected plastic objects to be exhibited. Objects made from thermoplastics such as, polystyrene, polyvinyl chloride, acrylics, polyethylene, polyamides and *Teflon*, may not be in good condition due to physical or chemical changes, hence

the need for preserving them.^[8]

Conservation in Portugal uses several analytical techniques (carried out at REQUIMTE (Rede de Química e Tecnologia) ^[9] and the Department of Conservation and Restoration ^[10] of FCT-NOVA (Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa – Faculty of Science and Technology, NOVA University), such as spectroscopic and chromatographic methods. Both allow the identification of plastic materials as well as the evaluation of their state of preservation and stage of degradation. To study these materials, very small samples of less than 1mm are collected. Through portable equipment, it is even possible to analyse materials *in situ*, thus avoiding to investigate isolated microsamples or to move objects from their places of storage.

Tasks

The project is scheduled to be developed over the course of three years. During this time, we intend to carry out 10 tasks, namely:

- Task 1
Communicating the science of plastics: their structure, and the relationships between structure, characteristics and aspects of production. The task will be predominantly centered on the objective identification of the relevant technical-scientific and industrial aspects of plastics, as well as the presentation of this information form appropriate for the general public.
- Task 2
Evaluation of the preservation conditions of historical plastic objects. This task aims to evaluate the chemical and physical condition of selected plastic objects to be exhibited. The approach used will involve the direct chemical analysis of micro-samples (on a microscopic scale in order to preserve the objects) and the preparation of

reconstructions. With this approach, besides the material's intrinsic chemical and physical properties, the distinct ways in which it was industrially transformed will be considered. This will allow us to further assess the influence of additives and manufacturing processes on the stability of the material.

- Task 3
Household plastics: design and everyday life. In this task we aim to analyse the integration and impact of plastics on daily practices. This will be done in particular through looking at industrial design. To this end, we will look at aesthetic components associated with the use of plastics. We will consider not only the design of artifacts produced, but also the artistic and architectonic productions, given that a number of designers, artists and architects choose plastics as the raw material for their works.
- Task 4
Industrial interaction:
This task aims to identify the relationship between the plastics and electrical industries in Portugal. Here we aim to create a database with the discourses of the main historical agents, their arguments and networks of relationships.^[11]
- Task 5
Industrial competitive relationships:
How did the plastic industry promote the local business community and compete with the glass industry. With this task, we aim to analyze the publicity relative to the plastics industry; to study the pathways of individual businessmen and the local elite. This will be done by understanding the genesis of entrepreneurship and its relationship with the success of business, by evaluating the role of the media in providing recognition for the plastics industry and its entrepreneurs,

by examination of the role of the plastics industry representatives in supporting their sector, and by investigation of the diffusion and expansion of the plastics industry in a region with an established glass industry.

- Task 6
Memory and oral history of the workers in the plastic industry: the lived experience and the impact of the industry on individual lives: The task will collect life histories of former plastic industry workers. As in any writing of history, the voice of the subaltern is often muted by the official narratives. The aim of this task is to document the social aspect of the industrial venture and give it its rightful place at the same time as it seeks to unravel the impact these innovative industrial ventures had on individual lives and respective social worlds.
- Task 7
Plastics' Energy (a measure of quality differences between different forms of energy) ^[12] and environment costs in historical perspective: From a qualitative point of view, we will analyze the amount of energy content required to produce plastics and its production costs (i.e. raw materials and transportation); the measurement methodology of H.T. Odum ^[12] here representing an essential technical reference. This level of analysis is completed with an attempt to include both production and environmental costs related to plastics energy accounting. This line of research will develop educational tables to be displayed at the museum. Apart from academic results and publications, these tables will illustrate in a historical perspective the manufacturing process, including input-output maps of the energy content of plastics. A comparison of energy content of

plastics with the materials replaced by plastics will result, these expository materials revealing the amount of energy consumed during its production in comparison with materials derived from cork, metal or wood. In sum, we aim at disseminating and trading off the net energy required to produce an object compared with its equivalent made of plastic. The introduction of the environmental costs within this cost accounting will represent the last step of the analysis, by introducing environmental cost concepts of different materials, to understand how Portuguese national resources were affected by plastics.

- Task 8
Writing a book: History of plastic objects in Portugal from their first appearance to the present day: The book will be the result of a multidisciplinary investigation carried out by all of the team members.
- Task 9
Exhibition on the history of plastic materials: its fabrication, use and impact on Portuguese society. This task will consist in compiling an exhibition on the history of plastic materials: its fabrication, use and impact on Portuguese society from the middle of the 20th century until today. The main steps will comprise the preparation of text for the exhibition; creating the respective catalogue; selecting and organizing additional means of dissemination, for example, videos, DVDs, films, photographs and other media deemed relevant; monitoring the production and mounting of the exhibition; displaying equipment representative of the main technological stages of the plastics industry; making an inventory of national assets, photography and film.

- Task 10
Organization of an International Congress: The congress will represent the culmination of this thorough research process and aims to disseminate the achievements of science and technology in Portugal, in the particular field of plastics. During this meeting, researchers will be able to compare and discuss the Portuguese situation, as well as explore the potential for future cooperation.

Summary of key aims for the new museum

To date, this project seems to be unique in aiming to set up a Museum of Plastics in Portugal. Its main objective is to safeguard the heritage of the plastics industry and the consumers of plastics, with a view to the musealisation of objects that are representative of the major technological advances occurring over the history of plastic materials. At the moment, there are private collections of plastic toys, some having been catalogued by amateurs not always demonstrating an acceptable level of scientific rigour.

Specifically we aim to make a collection of objects in collaboration with relevant companies by researching their archives, especially the oldest, in order to gain an overview of surviving photographs, catalogs and other historic documents. On the other hand, we would like to motivate entrepreneurs to preserve the heritage of their business, even if it does not feature in a future museum.

Thus, in order to identify the existing heritage, we have visited some of the major historic plastics' companies "still in action", like Bakelite Liz (1946), Plasticos Santo António (1950), as well as collections of plastic toys displayed at the toy museum at Ponte de Lima. Unfortunately, many of the production

artefacts of these companies such as equipment have been scrapped, in some cases out of lacking sensibility for their preservation and in others merely out of lack of space on their premises.

From an institutional perspective we are convinced that the future museum should have at least the following facilities:

- 1) Exhibition Area;
- 2) Auditorium;
- 3) Study and Research;
- 4) Conservation and Restoration;
- 5) Shopping and Leisure;
- 6) Services.

Among these areas, the more demanding will be that of Conservation and Restoration, with good storage space ensuring "environmental conditions such as light, ventilation and the percentage of relative humidity". The facility should also have the technical capabilities to conduct research in the field of conservation.

For a future Plastics Museum, like with a modern industrial museum, we argue that it should combine, on the one hand, the historical and science and technology focus, thus avoiding it becoming only a "deposit" of items (machines). On the other hand it should fulfill an important social and cultural role in keeping "alive" the collective memory of the plastics sector that has been developing over the past 80 years.

Its location in Leiria, the birthplace of the plastics industry in Portugal, would undoubtedly promote the plastics sector and the region, raising their respective profiles both nationally and internationally. In conclusion, it is our objective that the Museum of Plastics be a showcase of the development of the Portuguese plastics industry as well as a centre focusing and popularizing culture, science and technology.



Figure 1. Documents from Baquelite Liz's Archive Collection, a pioneering Portuguese plastics factory^[13]

PLÁSTICOS PARA TODOS OS FINS

BAQUELITE LIS, L^{DA}
 Gândara dos Olivais
 Telef. 22642 LEIRIA

Ref. 558 Taca para fruta «Matarei» arred. Dimensões: 210 mm de diâmetro

Ref. 74 Caixa para tempero grande «Rigida» grande com 10 compart. «Café», «Pimenta», «Canela», «Erva-doce», «Cominho», «Cravo», «Sal», «Alho», «Cebola», «Chá» e «Pimenta» Dimensões: 50 x 45 mm

Ref. 67 Escumador com passador «Rigido» Dimensões: 130 mm de diâmetro

Ref. 62 Escumador pequeno «Rigido» Dimensões: 110 mm de diâmetro

Ref. 80 Prato de sobremesa «Rigido» Dimensões: 200 mm de diâmetro

Ref. 120 Caixa para tempero pequena «Rigida» para usar com os diversos. «Café», «Pimenta», «Canela», «Erva-doce», «Cominho», «Cravo», «Sal», «Alho», «Cebola», «Chá» e «Pimenta» Dimensões: 50 x 45 mm

Ref. 161 Colheres «Rigidos» Dimensões: 240 x 110 mm

Ref. 180 Talher para caracem «Rigido»

Ref. 78 Colheres retemplar «Rigidas» Dimensões: 227 x 100 mm

Ref. 131 Para para copos «Matarei» Dimensões: 100 x 100 mm

Ref. 133 Primavera/Salero «Rigido» Dimensões: 50 mm de diâmetro

Ref. 176 Espátulas para «Rigidas» Dimensões: 235 mm de comprimento

Ref. 24 Primavera redondo «Rigido» Dimensões: 40 mm de diâmetro

Ref. 35 Salero redondo «Rigido» Dimensões: 40 mm de diâmetro

Ref. 84 Tapa de boca para garrafas «Rigidas»

Ref. 70 Talher para sopa «Rigido» Dimensões: 240 mm de comprimento

Ref. 166 Primavera/Salero «Torrada» «Rigido» Dimensões: 70 x 30 mm



Figure 2. Documents from Baquelite Liz's Archive Collection, a pioneering Portuguese plastics factory^[13]

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