

AGING OF PLASTICS, INCLUDING RESILIENT NON METALLIC ARTIFICIAL MATERIALS BEING USED IN THE WATER INDUSTRY

J.M. Jordaan

Water utilisation Division, Chemical Engineering Department, University of Pretoria, Pretoria, South Africa

Keywords: plastics, aging and deterioration, non-metallic materials, waterworks, hydraulic structures, pumps and valves, equipment maintenance.

Contents

- 1. Introduction
- 2. Advantages
- 3. Disadvantages
- 4. General
- 5. Conclusion
- Glossary
- Bibliography
- Biographical Sketch

Summary

The article is a brief introduction to the benefits and detriments of the use of plastics (and other artificial flexible or pliable materials) in the water industry, with emphasis on seals, waterstops and pipes or conduits. First cost versus maintenance cost is a key factor in the economical use of plastics in the water supply scenario.

1. Introduction

Plastics, in its many different forms, have been introduced into water engineering structures for various purposes. It has supplanted more conventional materials such as leather, wood and rubber, for seals and gaskets in pumps and gate valves, also replaced copper and neoprene as water stop material in construction, and has taken over a large part of the lightweight pipe industry for supplying agricultural and domestic water distribution systems. It is also used extensively in the place of concrete as liners and covers for reservoirs, canals and conduits. Nevertheless, in spite of its economical, weight reduction, ease of machining and handling features, it has a few drawbacks, which could be important considerations in sustainable life-support systems. Some of these considerations would also apply to natural, resilient products, such as leather, rubber, wood, bitumen, fiber, jute or asbestos.

2. Advantages

The following are considered the most advantageous features of plastic and other related artificial lightweight resilient materials:

- Low cost, lightweight, easily handled and transported (e.g. in the case of water pipes)
- Rapid construction (in the case of pond liners, inflatable dams, floating covers and inflatable roofs)
- Ease of machining, cutting and joining (in the case of water stops, seals, gaskets, pipe and pipe fittings)
- Ease of manufacture of impression-moulded and vacuum-formed products such as small-size valves and fittings
- Very suitable for temporary construction and housing on waterworks sites, including form work panels for concrete structures
- Non-corrosive, very smooth interior surfaces in extruded sections used for pipelines
- Tough, compared to asbestos cement, and can withstand more shock loading
- Structural flexibility, especially for use as conduits, pipelines and water containers

TO ACCESS ALL THE 4 PAGES OF THIS CHAPTER,
 Visit: <http://www.eolss.net/Eolss-sampleAllChapter.aspx>

Bibliography

Encyclopaedia Britannica (1975). "Plastics and Resins," 15th Edition. Volume 14, pp. 510-555. Chicago: Benton. [Contains a comprehensive presentation of the history, types, manufacture and uses of industrial plastics].

Van Asbeck Baron W.F. (1955, 1964). *Bitumen in Hydraulic Engineering*. 2 Vols. London: Shell Petroleum, also: Amsterdam/London/New York: Elsevier. [An important reference, dealing with the use of bitumen in hydraulic and coastal engineering construction].

Biographical Sketch

Jan Jordaan, B.Sc. (Eng.) Wits.; S.M. Civ. Eng. Wisc.; Sc.D. (Civ. Eng.) MIT is a retired Civil Engineer (Hydraulics) with experience in design, research and teaching in the hydraulics field.

He was involved in the investigations for water sources for Namibia from 1974 to 1981 as Chief Engineer Investigations in the Department of Water Affairs, Windhoek, Namibia and helped in directing the pilot plant reverse osmosis desalination project at Swakopmund in that country. He also made a study of other desalination processes on a European Technical Study visit and previously participated in ocean-related research programs at the United States Naval Civil Engineering Laboratory, Port Hueneme California,

USA, as Hydraulic Research Engineer. He also lectured in Hydraulics and Ocean Engineering at the Universities of Hawaii, Delaware and Pretoria for a total of fourteen years. He retired as Director: Design Services with the Department of Water Affairs and Forestry, Pretoria, South Africa, after a period of continuous service of twenty-eight years.

UNESCO – EOLSS
SAMPLE CHAPTERS