

LEAD INDUSTRIES ASSOCIATION

400 LEXINGTON AVENUE

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METALLIC LEAD PRODUCTS DIVISION

CIRCULAR LETTER NO. 33

RECEIVED

1. LEADLINE

Teflon (suspensoid)

2. MANUFACTURER

E. I. duPont de Nemours and Co., to date is the sole manufacturer of Teflon. They process it to produce a water suspension which is sold in turn to industrial consumers such as the manufacturers of corrosives handling equipment.

3. INTRODUCTION

This Bulletin has been prepared in order to acquaint members of the Lead Industries Association with a new tank lining material which is still in the development stage but which may conceivably compete with lead linings - providing the manufacturer's claims are realized.

Teflon is a plastic developed by duPont which has been in use for several years as a corrosion resistant material for use as packing, gaskets and in similar minor applications, but because of its poor working characteristics and complete lack of solubility, it had not found much use as a tank lining material. However, researchers at duPont recently overcame the problem of application to tanks by grinding the finished plastic into particles fine enough to form a colloidal suspension and applying this to tank walls by the special methods described below.

The claims being made in the technical press about Teflon suspensoids are presented in this Bulletin. They have not as yet been substantiated by field experience and consequently may never live up to them. Because of similarities in installation methods, it is most likely that they will compete with glass and perhaps rubber-lined installations. Until a year from now when duPont gets into commercial production it may be difficult to predict with what materials it will most effectively compete on a cost basis and to what extent it competition may be felt, but in any event members of the Lead Industries Association will be aware of the existence of Teflon suspensoids and consequently will be in a better position to cope with whatever competition may develop.



4. PROPERTIES

The properties given below are based on claims made by the manufacturer.

Teflon (tetrafluoroethylene polymer) is resistant to heat up to about 500° F and practically all chemicals with the exception of molten calcium, sodium and potassium and, under certain conditions, fluorine. Its high corrosion resistance is matched only by its high cost and difficulty of fabrication into useful forms. The latter characteristic has been somewhat overcome by the development of sprayable Teflon suspensions, accomplished by grinding the Teflon into particles small enough to form a colloidal suspension in water. The suspension containing from 35 to 65 per cent solids looks much like milk or cream and can be stored for some length of time with little or no separation. Teflon finishes will adhere to many metals such as steel, aluminum, brass, copper and to glass (after sand blasting), porcelain and brick. Above 750° F Teflon may break down and decompose.

Dupont advertises the fact that "nothing sticks to Teflon." This is a good indication that applying Teflon linings to tanks will certainly require special treatment to obtain proper adherence.

5. METHOD OF APPLICATION

There are three types of Teflon spray coatings: primer, intermediate, and finish. The process for applying each is similar.

Before spraying the primer it is necessary to clean the metal surface washing off grease with a solvent and preferably sand blasting to assure the best possible adhesion. After spraying, the coating is air dried or forced dried at temperatures below 200° F to drive off the carrying water. The vessel being covered is then heated either by baking in an oven or by spot heating until the temperature is brought to around 750° F. At this point the tiny particles of solid Teflon turn to a jelly and fuse together giving a continuous film. As the metal cools the film becomes solid. If thin spots are found or damage occurs after use, the finish can be patched. However to accomplish this, the area must be cleaned down to the metal, more spray finish applied and fused with blow torch or gas flame.

The total thickness of Teflon finishes necessary to give protection against corrosion depends upon the nature of the chemical to which the finishes are to be exposed. It is claimed that in general, a primer coat about 0.3 mil thick, an intermediate coat and four to six finish coats of 1 mil each are required. For ultimate protection against most chemicals, a greater margin of safety is obtained by building up a heavier film. Far more important to users of Teflon lined equipment is the fact that suitable tests must be applied to assure freedom from pin holes and cracks before the equipment can be put into service.

6. COSTS

The costs given below are based on statements made by the manufacturer. It would not be unreasonable to assume that they represent the most favorable estimates and that lining costs for most chemical vessels would be far in excess of these figures, particularly the labor costs of preparation and installation.

Teflon sprayed finishes currently cost from \$55 to \$85 per gallon, depending upon the solids content. One gallon will cover about 300 square feet with a 1 mil coat. DuPont estimates that at present it would cost about 90 cents for materials and \$1 for labor on a four-coat lining of one square foot. The cost of lining large vessels will undoubtedly exceed this figure.

7. AVAILABILITY

The product is still very new and still in the development stage. It will be about another year before Teflon-lined vessels can possibly be available. DuPont's new Teflon suspension plant in Parkersburg, West Virginia won't be in production until around July, 1950.

8. CONCLUSION

The newly developed spray coating method of application materially adds to the utility of Teflon, the most inert of all plastics, but the usefulness of water suspended colloidal Teflon is definitely handicapped by the following:

First, the surface of the vessel to be covered must be suitably prepared before spraying. This usually means sand blasting since Teflon is noted for the fact that it "sticks to nothing." Second, the material is expensive and the labor and time necessary to line a vessel adds still more to the cost of application. Third, after lining, the vessel must be tested for freedom from pin holes and cracks before use. Fourth, a vessel must be heated in an oven or by spot heating to 750° F. In large vessels this can be an expensive and cumbersome requirement. About 750° F Teflon may break down and decompose. Fifth, coating entails four to six separate spraying and heating operations and even then the actual coating offers little protection against mechanical abuse.

Based on the above here are some points that may be useful in comparing with Teflons

1. Teflon linings are extremely thin; they may be likened to a paint film and hence the inherent possibility of film failure by cracking; and pin holes is always present.
2. For the same or perhaps less cost a far greater thickness of lead can be utilized thereby offering much greater protection to the metal beneath.

3. Surface preparation for sprayed Teflon linings is both cumbersome and expensive requiring sand blasting equipment and expensive controlled heating devices. An experienced and specially trained individual must be used to apply a Teflon lining. Besides the possibility of poor bonding, heating above 750° F may cause the Teflon to break down and decompose.
4. According to the manufacturer, all Teflon lined vessels must be thoroughly tested before being put into service. Pin holes, cracks and thin spots may be present and are difficult to detect. If uncorrected, their presence would lead to early failure of the vessel resulting in an expensive loss.
5. Like most plastic materials, Teflon may crack or rupture when subjected to a severe or sharp blow. No evidence has been offered to the contrary by the manufacturer. With linings of paint film thicknesses it won't take much to penetrate the Teflon.

In short, Teflon (suspensoid) is new and therefore is untried and unproven outside of the laboratory.

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