

# Aluminum Foil Manual

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## **FOREWORD**

No other single element that man works into useful shapes touches his life in as many ways every day as does aluminum. In addition to its many forms ideal for most of the mechanical, structural, utensil and hardware products traditionally made of common metals, aluminum also offers a wide range of foils in many combinations of thicknesses, widths and strengths.

Among these are foils that handle like wrapping paper yet exclude light, air, and water and mold and also "deadfold" to a snug, dependable contour, instantly producing a package of exceptional utility and visual appeal. Stronger, more rigid, aluminum foil is made into pans for bake-in packages, which keep foods in top condition in the freezer until ready for use.

Still other aluminum foils are used for cooling fins on refrigerators, and household and automotive air conditioners. In fact, the literally hundreds of applications for foil rolled from aluminum make it truly one of man's most important and attractive materials.

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# 1. Aluminum Foil

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## 1.1 Introduction

Aluminum foils emerge from the rolling mill with a natural shiny finish, almost as bright as a mirror; they also can be produced with an as-rolled, satin-like finish called *matte*. Additionally, foil has all of the unique functional characteristics of the aluminum alloy from which it is made, since it is the solid metal.

Foils of aluminum are rolled from several different alloys. Because all of the alloys commonly made into foil contain more than 90% aluminum and retain most of its properties, all are correctly called aluminum foil.



*Fig 1.1 Representative Foil Mill.*

Bare (plain), coated, or laminated, aluminum foil is the most effective material for the full range of flexible and other packaging forms employed to protect foods, drugs, cosmetics, and a lengthy list of other items. Even in countries where modern markets are not common, people benefit daily from aluminum foil in such packages as flexible pouches and laminated fibre drums which contain many of the food, pharmaceutical, and other products they consume.

In this single, abundantly available element we have a truly unique material in both properties and dimension. Moreover, aluminum products, including foil and cans are recyclable at low energy cost.

Add to the aforementioned, packaging and insulation, and the literally millions of aluminum electrical capacitors for radios, televisions, and most other electronic or electrical devices. Many motors and transformers also use aluminum as coil-winding conductor.

## 1.2 History of Aluminum Foil

Aluminum itself was first available in ingot quantity in 1888. The earliest production of aluminum foil was in France in about 1903, by Gautschi, employing the classical "pack rolling" method of reducing metal to foil thicknesses.

Gautschi stacked a number of thin sheets of aluminum into a pack which was then rolled between heavy iron cylinders heated internally by hot water. This was repeated each time with a progressively smaller gap between the iron cylinders, until the desired foil gauges were obtained.

In the United States, commercial production of aluminum foil began in 1913. As various early producers and consumers of metal foils became interested in this attractive material, both demand and production increased rapidly. By the end of World War II, eight plants were rolling foil. Today many more in this country and throughout the world are producing aluminum foil for hundreds of applications in major industrial and consumer markets.

Broadly grouped, the major U.S. industrial markets are Building and Construction; Transportation; Consumer Durables; Electrical; Machinery and Equipment; and Containers & Packaging. Together they encompass such a wide range and large number of end uses for aluminum foil that practically every household and every art and profession finds expression in this adaptable material. Some typical applications of aluminum foil, with their approximate foil market shares, are given in Table 1.1.

*Early Foil Applications* -- The first commercial use of aluminum foil in the U.S. apparently was for identification leg bands for racing pigeons, sometime around 1913-14.



*Fig. 1.2 Aluminum Coils.*