

*Part 65 of a series*

# What distributors should know about brazing and soldering fluxes

Distributors handle a relatively few flux types, but those types can be used in an almost endless variety of industrial and maintenance and repair applications.

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**F**luxes are essential in promoting wetting, which is critical for producing proper brazed and soldered joints. While most welding supply distributors handle fluxes, the average distributor salesperson has little knowledge of these products. They are usually forgotten or overlooked.

## Three major functions

Fluxes perform these three major functions:

- Chemical: remove surface oxidation and protect the cleaned surfaces against re-oxidation.
- Thermal: assist heat transfer from the heat source to the joint area.
- Physical: remove oxidation prod-

ucts and allow the filler metal to contact the base metal(s).

## Most popular fluxes

**Soft soldering fluxes:** These fluxes usually contain zinc chloride and hydrochloric acid and are quite active. This activity is needed to solder steel, stainless steel, and other difficult-to-solder

TABLE 1: MOST POPULAR FLUXES

FLUX TYPE	FORM	FILLER METAL	BASE METAL	HEAT SOURCE	ACTIVE TEMPERATURE RANGE
Soft Soldering	Liquid, Paste	Tin-Lead	Copper, Brass, Steel Stainless Steel	Air-Gas Torch, Solder Pot	120°-800°F
Aluminum Brazing	Powder, Paste	Aluminum-Silicon	Aluminum Alloys	Air-Gas Torch, Induction Heating	1040°-1140°F
Silver Brazing	Paste, Powder, Slurry, Liquid	Silver-Based	Copper, Brass, Steel, Stainless Steel	Air-Gas Torch, Induction Heating	1000°-1700°F
Bronze Brazing	Powder, Paste	Low Fuming Bronze	Copper, Steel, Stainless Steel, Cast Iron	Oxy-Acetylene Torch	1400°-2200°F
Cast Iron Brazing, Welding	Powder	Cast Iron	Cast Iron	Oxy-Acetylene Torch	1500°-2000°F
Stainless Steel Welding Backup	Powder	Stainless Steel	Stainless Steel	Mig and Tig Welding	2000°-2900°F



base metals. Most are liquids, but water soluble pastes are available, as are the common petrolatum-based pastes. Uses for these fluxes cover the entire range of building/housing, industrial, and maintenance applications.

**Aluminum brazing fluxes:** These products contain both alkali chlorides and fluorides in powdered form. Containers must be sealed to prevent moisture pickup, which reduces flux shelf life. They are used to braze aluminum and its alloys in air-conditioning, automotive, and maintenance applications.

**Silver brazing fluxes:** Complex fluorides are essential ingredients in these products. Silver brazing fluxes come mostly in paste form, but are also available in slurry form and as liquids for easy dispensing. Applications cover a very broad range of industrial uses.

**Bronze brazing fluxes:** These products do not generally contain fluorides. The fluxes are usually powders and have a good shelf life. Applications include farm machinery, maintenance, and special work with steel, where welding is not practical.

**Cast iron flux:** This flux is a powder that does not contain fluorides. Applications cover all areas that utilize cast iron parts, such as large engine repair, farm machinery, and maintenance.

**Backup flux:** This product is used in Mig and Tig welding of stainless steel to protect the backside from oxidation. It takes the place of an inert gas purge and backup tape. Applications include paper-making machinery, chemical and food equipment, and refinery piping.

#### Walk-in trade and MRO accounts

Most walk-in customers use flux for do-it-yourself projects or maintenance and repair jobs. They generally know what they want and will find the flux of choice among the products listed in Table 1.

Information on filler alloys, base metals, and active temperature ranges will be helpful if assistance is needed on the flux/filler metal combination most suitable for the application. Directions and safety precautions will be found on the container label and in the MSDS (material safety data sheet).

These customers want to do a good job, but they are not as finicky as production engineers, who deal with materials meeting military and industrial

specifications and whose work must meet rigid QC standards.

#### Production accounts

Relatively large quantities of both soldering and brazing flux are consumed by these industries: air-conditioning, appliances, automotive, carbide tools, mining tools, plumbing, and refrigeration.

While many large accounts are serviced directly by flux manufacturers, there is an increasing trend toward OEMs buying flux and related products from welding supply distributors. This is a result of the recent popularity of just-in-time (JIT) delivery, which favors local warehousing, and the growing reluctance of manufacturers to store large quantities of chemicals in premium space.

Supplying these quantities of flux to manufacturers is good business. However, it is important for welding distributors to note the following:

- Prices are very competitive.
- Delivery schedules are tight.
- Quality standards are high.
- Products generally must meet government or industrial specifications.
- Personal visits are required.

Table 2 lists the most common flux products used in large scale production.

#### Safety concerns

Soft soldering fluxes are generally corrosive liquids so care must be taken in their storage and shipping. Containers must be DOT-approved and shipping must be done in accordance with DOT regulations.

Proper care must be taken in using silver brazing and aluminum brazing

fluxes because they contain fluorides. Bronze brazing fluxes are generally fluoride-free.

In all cases, the manufacturers' material safety data sheets (MSDS) should be consulted when any questions arise.

#### Summary

Fluxes are essential for most brazing and soldering processes.

The number of different flux products carried by welding supply distributors is relatively small, but it still is important that distributor employees have at least a rudimentary knowledge of these products and how they work.

Walk-in customers have needs that are relatively easy to meet. Production accounts represent good business, but pricing is very competitive and delivery and quality requirements are demanding.

Some fluxes contain hazardous chemicals so it is imperative that welding distributors supply know-how to store and ship those products. **TWD**

#### ABOUT THE AUTHOR

*Dr. Yehuda Baskin received his B.S., M.S., and Ph.D. degrees in geology from the University of Chicago. He was employed by IIT Research Institute, Chicago; Argonne National Laboratory, Argonne, Ill.; and Ferro Corporation, Cleveland, where he conducted research on a variety of inorganic materials.*

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TABLE 2: LARGE-SCALE PRODUCTION FLUXES

FLUX TYPE	FORM	APPLICATION	SPECIFICATIONS
Soft Soldering	Liquid	Plumbing, Air-Conditioning	O-F-506C Type I, Form B
Silver Brazing, White	Paste	Air-Conditioning, Appliances, Plumbing, Carbide Tools	O-F-499D Type B, AMS 3410G, AWS Type 3A
Silver Brazing, Black	Paste	Carbide Tools, Mining Tools	AMS 3411B, AWS Type 3C
Aluminum Brazing	Powder	Automotive, Air-Conditioning	AMS 3412B
Bronze Brazing	Powder	Farm Machinery	MIL-F-1613B Type A
High Temperature	Paste	Mining Tools	AWS Type 3D