TECHNICAL BULLETIN

EHE

TB1003

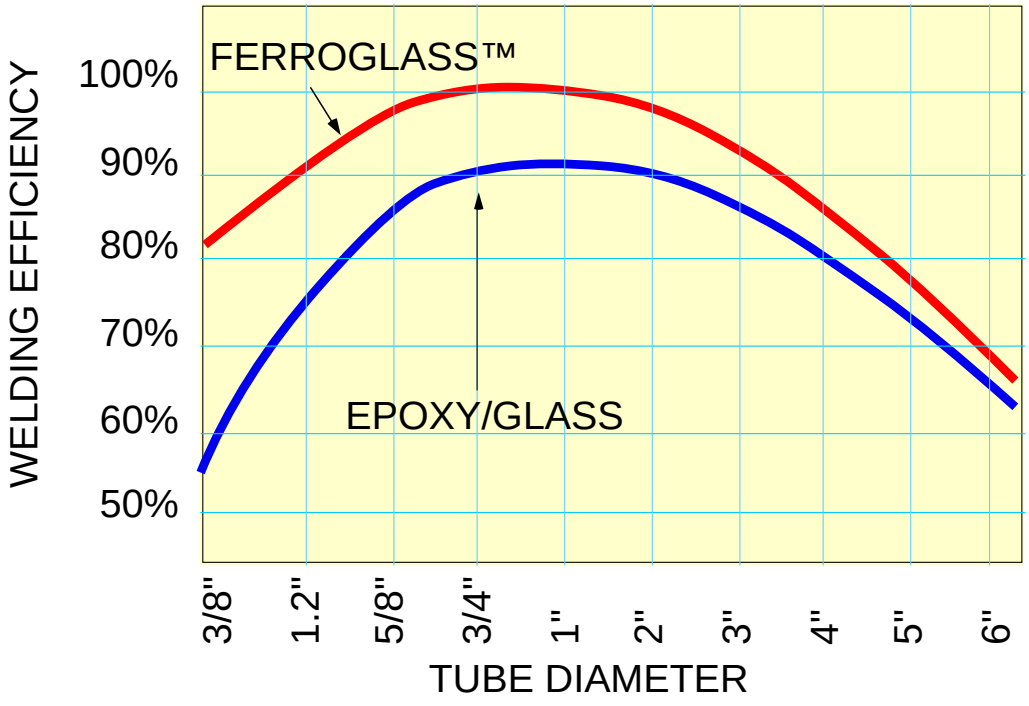
USE OF FERROGLASS™ CASING FOR IMPEDERS

Ferroglass™ impeders can increase weld speeds by as much as 40% when induction welding small diameter tubing.

What is Ferroglass™?

Ferroglass™ is our proprietary brand of epoxy/glass tubing which has up to 60% by weight of ferrite powder added to the epoxy resin. This has the effect of reducing the reluctance[1] of the magnetic circuit which includes the work coil, the impeder and the tube. The result is an increase in welding speeds of 30% or more compared to conventional impeder casing materials.

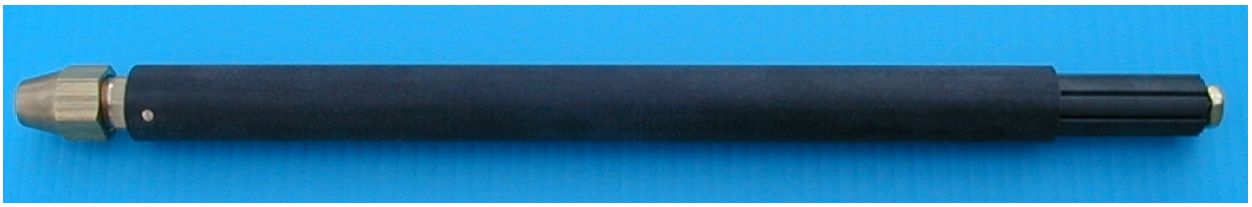
The performance gain due to the Ferroglass™ casing is greatest at small diameters, where the amount of ferrite in the casing is an appreciable percentage of the total magnetic material present in the magnetic circuit. Speed increases of 40% have been measured using 6.5mm diameter Ferroglass™ impeders. When the impeder diameter exceeds 30mm, the gain may be as little as 5%. The chart below depicts the welding efficiency for different tube diameters, using both Ferroglass™ & conventional impeder casing.



[1] *Reluctance is the magnetic equivalent of electrical resistivity. It is also expressed as the reciprocal of permeabilty. A low reluctance magnetic circuit increases the amount of energy transferred from the coil to the welded tube.*

Additional benefits of Ferroglass™

The ferrite powder used as a filler in Ferroglass™ impeder casing is an extremely hard material, with a hardness exceeding 10000N/mm^2. This greatly increases the mechanical wear resistance of the impeder casing, & can lead to longer working life in those cases where the impeder is subjected to abrasion from the moving tube.



THROUGH FLOW IMPEDER WITH FERROGLASS™ OUTER CASING & EXPOSED FERRITE

Ferroglass™ in return flow configurations.

Ferroglass is manufactured by adding ferrite powder to the epoxy resin before it is applied to the glass reinforcment fabric. The additional of the ferrite increases the viscosity of the resin and reduces its ability to fully “wet out” the fabric. This results in some porosity, generally along the length of the glass fibres, which may cause the Ferroglass@ casing to leak.

The amount of porosity is highly variable & impossible to avoid. Because of this, we do not recommend the use of Ferroglass™ in any application where leakage of coolant from the impeder will be of concern.

Through flow impeders often begin to leak coolant long before they fail completely, This is generally of no concern & may actually extend the life of the impeder since the leaking coolant may retard further damage. Unfortunately, when a return flow impeder starts to leak, it usually has to be replaced immediately. Because of this, return flow impeders use the most heat resistant materials available for the application. Tests carried out by ourselves & several of our customers indicate that the life of return flow impeders can be greatly extended by using a silicone resin bonded glass fibre tube (Silglass™) for the outer casing. Silglass™ is inorganic & thus does not char or blacken when it is heated. The heat that an impeder is exposed to is mainly in the form of radiant energy from the weld area, so the white, specular surface of Silglass™ tends to reflect this radiation away, rather than absorb it as a dark coloured material such as Ferroglass™ would. Aluminium oxide ceramics also work well as return flow impeder casings, but are expensive & fragile.

Precautions

Ferrite is chemically inert & is not known to cause any health hazard. Normal precautions should be followed to prevent inhalation or ingestion of any dust resulting from machining the material.

Because Ferroglass™ is extremely hard, it will quickly dull most cutting tools. It is best cut using a silicon carbide abrasive wheel & any holes should be drilled using tungsten carbide drills. If these are not available, standard twist drills may be used however they will require frequent resharpening. Low cutting speeds (SFPM) & high feed rates have been found to provide best tool life.

Electronic Heating Equipment, Inc.

P.O. Box 7139 - Bonney Lake - WA - 98390 - USA

Phone: 1-360-829-0168 Fax: 1-360-829-0170

email: impeder@sprynet.com Web: www.impeder.com