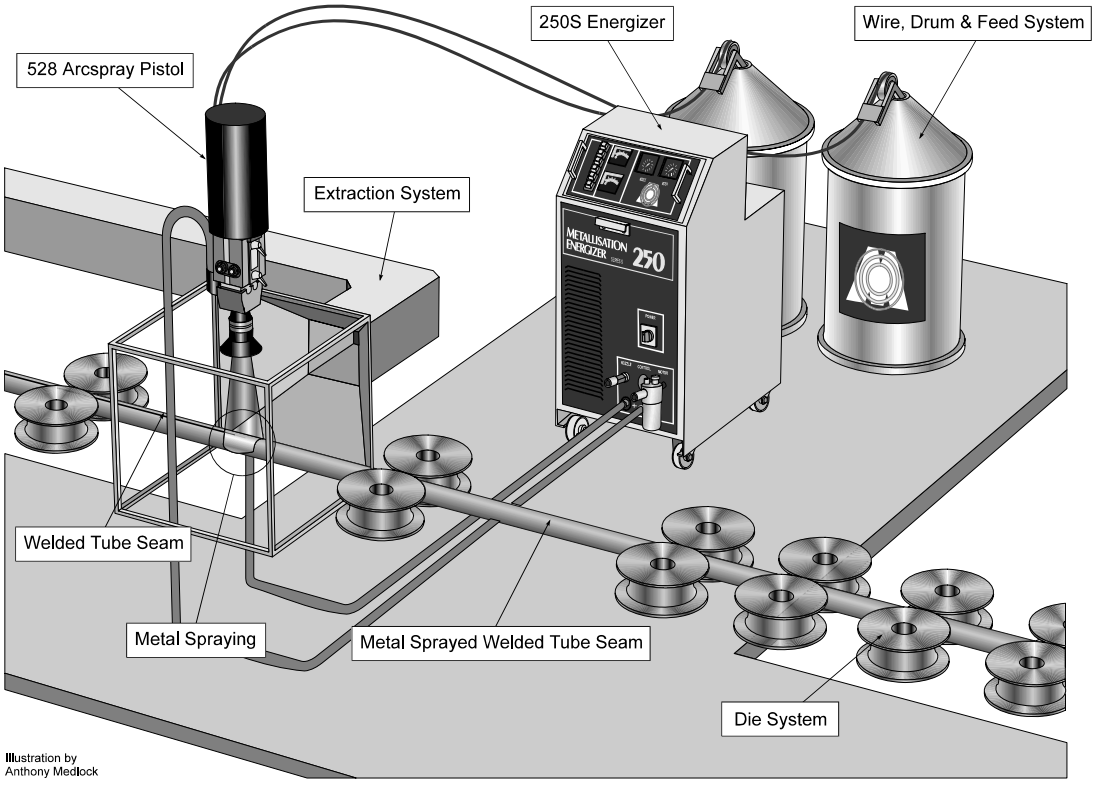
Metallisation
Thermal spray equipment and consumables

SEAM SPRAYING OF PRE-COATED E.R.W TUBE

Application Data Sheet LE-AC-001



INTRODUCTION

Tube is produced on a tube forming mill by Electrical Resistance Welding of the longitudinal seam. By using pre-coated steel strip, tube with enhanced corrosion resistance can be produced. Pre-coated steel strip is available with zinc coating (galvanised), aluminium coating (aluminised) or Zn/Al Alloy Coating (various trade names apply - Galvalume, Zincalume, Aluzinc, Zalutite, and Galfan).

During the welding process, the heat generated around the weld area and the subsequent tooling operation to remove the weld fin destroys the external coating around the weld area; unless re-protected this area of the tube will corrode.

The re-protection of this weld damage is achieved by applying a metal sprayed deposit with a material which affords similar corrosion resistant properties to the strip pre-coat.

This "in-line" method of repair is the only method available which offers the flexibility of producing tube with zinc, aluminium or Zn/Al coatings.

APPLICATIONS

Corrosion resistant tube produced by this method is made and used throughout the world for many diverse applications. These include:-

- Domestic and garden furniture
- Car seat frames
- Horticultural tunnel type greenhouses
- Children's play area equipment
- Car ports
- Parking barriers
- Balustrade
- Conduits
- Motor vehicle exhaust systems (aluminised) etc

The selection of coating material depends upon the application for which the tube is to be used.

In general, the following guidelines apply:-

Pre-galvanised tube - Tube made from strip which has a hot dip galvanised deposit applied during manufacture. The galvanised deposit thickness being in the range - 14 to 20 microns (200 to 275 grams/m^2, both sides coated). The weld damaged area is sprayed with a zinc deposit (02E) to a thickness of approximately 0.04mm.

Temperature limitation of finished tube up to 150°C.

Life expectancy - dependent upon pre-galvanised deposit thickness and working environment. Used in non-polluted rural environments.

Pre-aluminised tube - tube made from steel strip which has a hot dip aluminised deposit applied during manufacture. The aluminised deposit thickness being in the range - 40 to 50 microns (230 to 290 grams/m^2, both sides coated). The weld damaged area is sprayed with an aluminium deposit (01E) to a thickness of approximately 0.05mm.

Temperature limitation of finished tube: - up to 500°C.

Life expectancy - dependent upon pre-aluminised deposit thickness and working environment.

Used in applications which involve operation at elevated temperatures or where thermal cycling occurs. Also recommended for coastal or offshore environments.

Tube pre-coated with Zinc/Aluminium Alloys - tube made from strip which is pre-coated during manufacture by a hot dipping process.

Trade names - Galvalume, Zincalume

Aluzinc and Zalutite have an analysis 43% Zinc/55% Aluminium and other trace elements

Galfan has an analysis 95% Zinc/5% Aluminium and trace elements of mischmetal (lanthanum cerium)

The weld damaged areas can be treated with either:-

(01E) Aluminium or (21E) a Zinc/Aluminium Alloy in the approximate ratio 85% Zinc/15% Aluminium

At time of preparation of this bulletin, Zn/Al Alloys in the ratio 43% Zn/53% Al are not available in wire form.

EQUIPMENT

Metallisation 528E Arcspray System

MATERIALS

Metallisation (02E) 99.99% purity zinc wire

Metallisation (01E) 99.5% purity aluminium wire

Metallisation (21E) 85/15% purity Zn/Al wire

(All wires 2.0mm diameter)

METHOD

The weld repair system can be installed on to either new or existing tube mills. The spraying pistol must be located as close as possible to the fin removal tool and if possible within 1 metre of the welding coil. The surface to be sprayed should be clean and dry. No "carry over" of lubricating fluid can be tolerated in the spray area, because the mechanism for the adhesion of the coating relies upon the inherent heat retained in the weld seam. It is also undesirable to have excess cooling fluid contaminating the spray chamber as this can lead to a build up of dust which may restrict air flow in the extraction ducting.

The deposit is applied using the following equipment:-

Spray Pistol	-	Metallisation Electric Arcspray 528E Model fitted with CG20 Head
Power Source	-	Metallisation Series 250S (Switched Unit) Rated at 250 amp duty 100% duty cycle
Spray Controller	-	Electronic Controller to accurately control and meter the deposition rate of the 528E Pistol
Wire Dispensing	-	Various wire dispensing options are available dependent upon materials to be used and space available in location of spray area.

TYPICAL PERFORMANCE DATA FOR ZINC SPRAYING

Tube Mill Speeds	-	60 to 110 metres/minute
Spray Distance	-	30mm from arc point
Atomising Air Pressure	-	5 BAR (approximately 80 psi)
Spray Voltage	-	21 to 23 volts when spraying
Spray Current	-	150 amps

NOTE: Coating quality may be affected by mill line speed and tube size. Slight compensating adjustments may be required to the above parameters.

COATING PROPERTIES

Any metal sprayed deposit exhibits some degree of porosity (hence the need to apply slightly thicker sprayed deposits than the pre-coatings which are hot dip applied). The "as sprayed" deposit has a fine satin appearance, surface finish. After spraying, the sizing roll stations of the tube mill will slightly deform the sprayed deposit to produce a flattened partially shiny appearance. The sizing operation will also reduce surface porosity.

The sprayed coating will withstand deformation and manipulation.

ADVANTAGES OF METALLISATION ARCSPRAY SYSTEMS

Combustion Flame Spraying has in the past been used for this application. Electric Arc Spraying offers slightly significant benefits over the combustion Flame spray method. These include:-

Economic	-	Energy costs when running arc spray equipment are approximately one tenth those of flame spray systems.
	-	No energy is consumed by Arcspray systems when wire is not being fed (unlike Flamespray systems in which gases are burned even when wire is not feeding).
	-	Arcspray equipment generally requires less maintenance and uses fewer spare parts than Flamespray systems.
Safety	-	Arcspray systems do not use explosive gases
Quality	-	Pre-set parameters ensure repeatable quality of Arcsprayed deposits
	-	Using Arcspray systems throughput rates can be varied independently of the size of wire being sprayed. Thus, spray rates can be co-ordinated with line speed to ensure even coating thicknesses are applied, independent of the mill operating speed, and spray rate adjustments for alteration in line speed, are made automatically.

- REFERENCE TECHNICAL BULLETIN N°S :-

2.2.2 Metallisation Wire 02E Zinc

2.2.1 Metallisation Wire 01E Aluminium

2.3.14 Metallisation Wire 21E Zinc Aluminium Alloy