

## Flame Treatment Technology

Flame Treatment

### Flame Treatment Of Plastics

In industry today the usage of plastics is becoming more widespread due to their increased processability, mechanical strength, and resistance to chemical attack. Due to the resistance of plastics to chemical attack, their use in painting or bonding applications is somewhat restricted.

It has been known that the surface properties of plastics can be changed by Flame Treating the surface prior to any painting or bonding application as means to increase the plastics characteristics of adhesion and help overcome any level of chemical resistance.

Treatment of the surface with the plasma of a flame imparts oxygen into the surface molecular layers of the substrate in order to increase the surface energy of the treated material. Increasing the surface energy (measured by dynes or contact angle), improves the wettability and provides an improved and consistent surface for further processing to occur, such a painting, printing, bonding, or laminating.



Flame Treatment Of A Bumper Fascia

### Approximate Surface Energy/Dyne Levels Of Common Untreated Plastics

Polypropylene	29
Polyethylene	31
Polystyrene	32
Ionomer (Low)	33
Ionomer (High)	37
Vinyl Acrylic	39
Saran	40
Cellulose	42
Polyester (Mylar)	43
Nylon	46

### Oxygen Content Of A Flame (Air/Gas Ratio)

All Flame Treatment Systems manufactured by FTS Technologies contain Oxygen Analyzers to monitor the air/gas combustion mixture for excess oxygen within the flame. The signal from the analyzer is processed and a tightly controlled predetermined level is maintained via an automatic gas trim proportioning solenoid. This proportioning solenoid controls the volume of gas entering the mixture line and maintains a constant and stable amount of excess oxygen within the flame.

The correct level of excess oxygen within the flame depends on the type of material being treated. Optimum ranges for today's modern substrates are between 0.2% and 1.0% excess oxygen within the flame with an accuracy level of +/- 10%. Processability studies will be conducted by FTS Technologies during the normal installation of the equipment and the appropriate oxygen set point will be determined.

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## The Burner-To-Target Distance

The optimum burner to target distance to ensure a high level of flame surface treatment is approximately three (3) inches. Once the optimum burner to target distance has been determined it is essential that the distance be accurately maintained with a tolerance of +/- 1/2 inch.

## Flame Contact Time With Product (Dwell Time)

The dwell time of the flame is critical as some 90% of the achievable treatment level (depending on the substrate) is obtained during the first pass of the flame over the substrate. Additional passes only serve to marginally improve the treatment level, and most systems utilizing traditional linear burner technology use a secondary pass to provide comfort when treating complex shapes.

Use of FTS Technologies Cirqual® Burner technology allows for complex three-dimensional shapes to be treated more consistently with faster robot traverse speeds than conventional linear burner technology due to the flames unique circular/mushroom flame shape, its ability to maximize dwell time, and wrap around edges and parting lines.

The traverse speed of the burner/flame across the surface of the substrate depends on the type of substrate being treated. FTS Technologies will determine the appropriate robot traverse speed during the normal optimization of the flame treatment process at time of installation.

## The Size Of The Flame (Energy Output)

The size of the flame and its output of energy is a major consideration when optimizing the flame treating process. The generation of heat during the process is an unwanted by-product that has no bearing on the quality of surface treatment.

However, the velocity of the flame impacts the total energy output from the burner, meaning that the higher the velocity the greater the amount of heat that is generated. FTS Technologies will balance the burners velocity in relation to energy output at the time of installation, taking into account that velocity is key in overcoming any boundary layers of air moving with the part and to ensure that the flame reaches into all intricate geometries.



The Cirqual® Burner



The Flame Treatment/Combustion Cabinets

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