ATMOSPHERIC PRESSURE OR LOW-PRESSURE PLASMA

THE QUESTION IS NOT “WHICH IS GOOD, WHICH IS BAD”
BUT “SUITABLE FOR THE APPLICATION OR NOT”.

	LOW-PRESSURE PLASMA		ATMOSPHERIC PRESSURE PLASMA		ATMOSPHERIC PLASMA – CORONA	
Application and properties	**Benefits**	**Setbacks**	**Benefits**	**Setbacks**	**Benefits**	**Setbacks**
Plasma generation in general	Plasma evenly distributed in the chamber Variable chamber volume (2 to approx. 12,000 litres and more)	Complex vacuum technology Complex automation is the pre-requisite for in-line production with extremely short process times	Treatment at the conveyor belt, suitable for in-line production, No vacuum technology	Limited treatment path (approx. 8-12 mm / nozzle, HE = 120 mm) Larger items require several rotating nozzles	Treatment at the conveyor belt, suitable for in-line production No vacuum technology, treatment width approx. 60 mm.	no conductive substrates, low treatment speed, poorest homogeneity
Treating metals	Cleaning of oxidation-sensitive substrates (e.g. H_2 or Ar as a process gas)	Overheating in case of excitation via microwave without protection. (other frequencies, overheating improbable)	In case of aluminium, very then oxide layers (passivation) can be generated	Items sensitive to oxidation by atmospheric oxygen are suitable with restrictions only. Special devices are required.	Not possible	Not possible
Treating polymers / elastomers	For elastomer and PTFE seals Activation of polymers and elastomers with fluorinated substances (etching process)	Materials (e.g. EPDM) require larger pumps	Pretreatment of “endless” items (e.g. tubes, cables etc.) Very short process time	Plasma jet of approx. 200 - 300 °C Overheating of thin substances if process parameters are not properly adjusted	Pretreatment of “endless” items (e.g. tubes, cables etc.) Very short process time	low treatment speed Poor uniformity of treatment and surface energy
3-D objects	Uniform treatment of all items. The interior of hollow spaces (e.g. ignition coil, plastic container, etc.)	Treatment of the interior surfaces of endless substrates (e.g. hoses) is complex	Local surface treatment is possible (e.g. flutes)	Complex automation / robot technology Significantly lower crack penetration	Suitable to a limited extent only	Complex articulated robot arm technology is required Very limited crack penetration
Bulk good items / powder	Rotary drum process for uniform treatment of bulk good items. Variable number of pieces and volume of parts/powder	Only approx. 1/2 to 1/3 of the rotary drum volume can be used (recommended)	Large bulk good items directly at the conveyor belt	Highly accurate positioning at the conveyor belt Treatment of powder is extremely complex	Bulk good items can be treated in the rotary drum	Lower treatment intensity Poor crack penetration
Electronics / semiconductor technology	Electronic components, printed circuit boards and semiconductor parts	Not known	Pre-treatment of metallic contacts/bond pads immediately before bonding	Increased temperature of the plasma jet Limited crack penetration Possible contamination	Not suitable due to high voltage potential	Not suitable due to high voltage potential
Coating processes	Uniform coats PECVD processes (e.g. hydrophobic, hydrophilic, adhesion promoting coats)	Possibly, contamination of the plasma chamber Plasma cleaning procedure is often required for the chamber	In-line coating possible	High-maintenance, dust formation The results are severely affected by ambient air parameters	Is not used	Is not used