METAL PAINTING

BASIC KNOWLEDGE OF SURFACE PREPARATION

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(A) Introductio

1: Understanding and knowledge of surface preparation prior to metal painting either new or re-painting is the single most important factor to consider and it also determine the coating durability. Surface preparation means different things to different people.

a. To a house painter, it may mean scraping off loose paint with a putty knife;
b. To a bridge painter, it may mean sandblasting off mill scale or old rust,
c. while to an aluminum extruder, it may mean anodizing.

2: Surface preparation is perhaps one of the most important aspects of paint coatings. It has been found that more than 80% of paint failures take place due to poor surface preparation.

(B). Definitions.

1: Surface preparation basically means creating a surface suitable for paint/coating application, a surface that can give strong adhesion to the paint/coating.

2: The main components of surface preparation are surface

cleanliness and anchor profile of the surface.

3: Both are obtained by blasting the surface with suitable abrasives which remove the corrosion and unwanted debris on the surface and give a suitable profile.

4: Before we go for blast cleaning, the surface must be pre-cleaned. Depending upon the source of the substrate, it may have different kinds of impurities.

5: A substrate may have dust, rust / corrosion products, grease and oil, and may be salt deposits on its surface.

6: Thus it must be pre-cleaned before blasting treatment is carried out.

(C) Standards.

1: The standards are based on following three most common standards (though there is other standard also available which include ASTM, JIS, DIN, BS etc.):-

a. SSPC (The Society for Protective Coatings)

b. NACE (National Association of Corrosion Engineers)

c. ISO (International Organization for Standardization)

2: Generally speaking blasting cleaning to SSPC SP-10 (Sa 2½) is common for most 2 pack systems and get good surface profile (up to 75µ to get physical adhesion as well). SSPC SP-6 (Sa 2) is common for surface tolerant epoxies.

3: Usually paint and coating manufacturers recommend extent of surface cleaning as per their products and it is mentioned in the data sheets. It is advisable to stick to manufacturer's recommendation and do not make short cuts. By doing short cut you may save some money but would severely damage the life of painted structure.

4: Pre-cleaning can be done either by solvent or hand tools or power tools. The SSPC Surface Preparation Specification SSPC-SP1 describes solvent cleaning as a means of removing oil, grease, dirt, soil, drawing compounds and other similar organic compounds.

5: The procedures vary from simple solvent wiping with a clean rag, through vapor degreasing, to emulsion cleaning.

6: The choice of technique depends largely on the type of contamination.

7: Solvent cleaning is specified as a prelude to the other, more aggressive, methods of surface preparation described by the SSPC.

8.Hand tool cleaning (SSPC - SP2) and power tool cleaning (SSPC - SP3) are often adequate for

Accepted standards of Industry for surface preparation is given in this table

Methods	Process involved	SSPC Standard	NACE Standard	ISO-8501 Standard
Solvent Cleaning	Cleaning with solvent either water, organic or inorganic by spraying, swabbing or dipping	SP-1	-	-
Hand Tools Cleaning	Remove loose mill scale, rust, paint. Tools required: Wire Brush, Scrapers, Chisel, Knife, Chipping Hammer	SP-2	-	S 12 or S13
Blast Cleaning	Full white metal	SP-5	NACE 1	Sa 3
	Near white metal	SP-10	NACE 2	Sa 2½
	Commercial blast cleaning	SP-6	NACE 3	Sa 2
	Virtual cleaning (sweep blast)	SP-7	NACE	Sa 1

Blast nozzle orifice size (mm)	Air required in cubic meter per hour) for various efficiency at different nozzle pressure		
	4 Bar	5.5 Bar	7 Bar
6.35	114	144	175
9.53	257	325	394
12.70	438	578	702

*Values given are approximate.

removing loose rust and previous coats of loose paint, especially in relatively small areas and in interior or normal atmospheric environments.
8: Blast cleaning is determined and surface condition is usually confirmed by visual inspection and comparing with visual standard provided by SSPC or ISO.

(D) Factors of Cleaning.

1: Factors to be considered what type of cleaning and blasting required, these factors are as follows:-

a. Type of substrate (metal surface to be painted)
b. Type of exposure
c. Corrosivity of area where structure is exposed
d. Desired life of the structure or painted object
e. Coating system to be applied

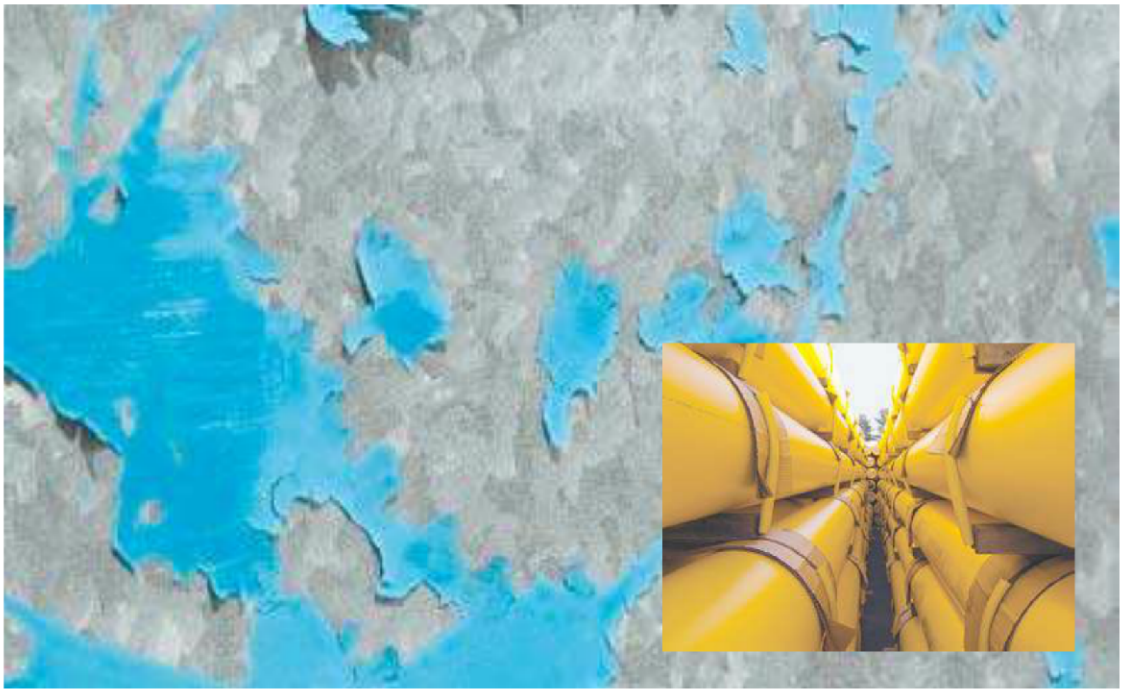
2: Personals involved in blasting and painting must have good knowledge of surface preparation and work efficiency. For example before the work start they must know what should be the size of blasting nozzle and in how much time they can blast how much area.

3: Availability of air is extremely important because if you do not calculate what amount of air (m3/hr) is required, you cannot achieve desired results.
Just for reference below is chart of the efficiency of a blast cleaning process as a function of nozzle size and air availability.

4: Other factors are also important when doing blasting e.g., wind velocity, atmospheric temperature, humidity, dew point etc., in addition to distance of nozzle from the surface and experience of the person.

5: Selection of blasting material is

Abrasive Type	Abrasive consumption rate (kg/m2)	Extent of cleaning (m2/min)
Silica Sand (14 / 35 mesh)	12.75	0.44
Garnet (30 mesh)	17.50	0.33
Copper Slag (14 / 35 mesh)	15.00	0.40
Aluminum Oxide (30 mesh)	15.10	0.42
Steel grit G-40	27.00	0.30



important as well, it depends on the requirement, economy and most important

6: Environment regulations. Different type and size of blasting material give different extend of cleaning and most important the surface profile.

7: Before quoting for blasting job, one must calculate the abrasive quantity based on job specification, requirement and substrate condition.

(E) Methodology

1: Above surface preparation is mainly for mild steel (MS), cold rolled steel (CRS) and hot rolled steel (HRS).

2: For electro-galvanized (EG) depending on the condition only solvent cleaning as per SSPC SP-1 is enough

3: similarly for hot dip galvanized (HDG) SSPC SP-1 is recommended.

4: if condition is not so good (stored outside and have some deposits or zinc oxide layer then sweep blasting SSPC SP-7 or Sa 1 is recommended.

5: In addition to conventional blast cleaning procedures, other equipment and techniques are available for preparing surfaces using a mixture of abrasive and water, known as 'Wet Blasting', or 'Wet Abrasive Blasting'.

6: Wet Blasting or Wet Abrasive Blasting definition:-

a. The technique is described in SSPC-TR 2 / NACE 6G198 Joint Technical Report – Wet Abrasive Blast Cleaning.
b. It is a method of cleaning where water is injected into the air/abrasive stream generated by conventional abrasive blast cleaning equipment.

The unique feature of Dry Ice Blasting is that dry ice vaporizes on contact with the surface to be cleaned.

7. Objectives:-

a. The objective is to remove contaminants and suppress the dusting effect caused by the impact of the abrasive on the substrate, while retaining the blasting characteristics of dry abrasive, including creation of anchor profile'.
b.Ultra-High-Pressure Water Jetting is In contrast to wet abrasive blasting,
c. SSPC-SP12 describes high and ultra-high- pressure water jetting as a means of preparing or cleaning steel or other hard surfaces for re-coating.

d. SSPC defines water jetting as the use of water at pressures above 10,000 psi.

e. Pressures below 10,000 psi are considered water cleaning, not water jetting.

f. Ultra-high-pressure water jetting is performed at 25,000 psi or higher.

g.Water jetting differs from wet abrasive blasting in that it does not impart any surface profile to the substrate,

h.since it does not use any abrasive in the water stream.

i. What it can do, however, is to remove contamination such as dirt and rust, as well as old paint.

j. If the substrate initially had a profile, this profile will be retained by the water jetting process.

8. Dry Ice Blasting:-

a. It is a revolutionary blasting method that uses small, compact dry ice pellets as the blasting material.

b.The dry ice pellets are accelerated in a jet of compressed air similar to that used in traditional blasting methods.

c. Dry Ice Blasting is designed to replace high-pressure cleaning and other traditional blasting methods that use materials such as sand, glass and plastic as abrasive agents.

d. In addition, however, a wideÊrange of other cleaning methods that involve the use of hazardous chemicals, solvents, etc., can withÊadvantage be replaced by Dry Ice Blasting.

9. Advantages Of Dry Ice Blasting:-

a.The unique feature of Dry Ice Blasting is that dry iceÊvaporizes on contact with the surface to be cleaned.

b. Treated surfaces are therefore left dry and clean, without residues of detergents or blasting materials.

c.As the process is completely dry and non-conductive, Dry Ice Blasting can be used where other methods are unsuitable.

d. For example, electric motors and equipment with electric, pneumatic or hydraulic components can be cleaned direct using.

Dry Ice Blasting.

e. Dry Ice Blasting produces no waste products. Only the coating that has been removed remains to be disposed of,

f. This can usually be swept or vacuumed from the floor beneath the treated object.

g. Dry Ice Blasting is ideal for removing coatings such as adhesives, varnish, oil, grease, coal dust, soot, mould release agents and bitumen - to name but a few of the materials we remove daily using the process.

h. Dry Ice Blasting will often allow a company's production equipment to be cleaned while in operationÊwithout the need for dismantling and costly downtime.

i. Dry Ice Blasting is non-abrasive, and surfaces are therefore treated gently.

j. The system can thus be used on easily-damaged surfaces like nickel, chromium and soft aluminum.

National & International Events Update

Event In Pakistan	Organizer	Date & Venue	Website
Chem & Dye Tech Expo 2012	Event & Conference International (Pvt) Limited	June 15-17, 2012 Karachi Expo Center	www.chemdyexpo.com.pk
10th International Plastic & Packaging Industry Exhibition 2012	Pegasus Consultancy & UFI - Fairtrade	4-6 September 2012 Karachi Expo Center	www.plastipacpakistan.com
IFTECH Pakistan 2012	Pegasus Consultancy & UFI - Fairtrade	Karachi Expo Center 4-6 September 2012	www.foodtechpakistan.com
8th Build Asia Exhibition 2012	E-Commerce Gateway & Global Association of Exhibition Industry(Paris – France)	11-13 September 2012 Karachi Expo Center	www.buildasia.net
EGO Pakistan – International	FAKT Exhibitions	18-20 September 2012	www.faktexhibitions.com/
Energy, Oil, Gas and Power Conference & Exhibition	(Pvt) Limited	Lahore Expo Center	energyandpower.php
12th Security Asia International Conference & Exhibition	FAKT Exhibitions (Pvt) Limited	18-20 September 2012 Karachi Expo Center	www.securityasia.com.pk

International Events	Date & Venue	Website
Energy Ocean International Conference and Exhibition	June 19-21, 2012 at Double Tree's Coco Key Hotel, Boston, Massachusetts	www.energyocean.com
Bio-Processes International Conference and Exhibition	October 8-12, 2012 – Conference October 9-11, 2012 – Exhibition at Rhode Island Convention Center , United States	www.bioprocessintl.com
The Pipeline Protection Hot Topics and Marine Corrosion Conference	October 15-18, 2012 Edinburg, United Kingdom	www.bhrconferences.com
Metal Expo – 2012	13-16 November, 2012 Moscow, Russia	metal-expo.ru