

SELECTION + INSPECTION = FORMULA FOR SUCCESS

Phil Fouche
Quatro Products Corporation

ABSTRACT

In the past several years, there have been many advancements in the coating industry. The overall performance of all coatings has increased with the introduction of epoxies, urethanes and polyesters, which have better adhesion, abrasion and chemical resistance, along with increased gloss retention for high quality paints.

The selection of a paint or coating system for any given situation will require certain considerations:

- (1) the environment,
- (2) degree of surface preparation,
- (3) economics.

After all these factors have been considered, select a system that will provide the best protection and general appearance for the longest possible time, at the lowest square foot cost per year and per mil thickness applied.

The most important factor in the application of coatings is the human factor. More specifically, the selection of a competent paint/coating applicator and the inspection of the paint/coating process is where the success of the job lies. And, if applied correctly, it should not fail prematurely. All paint and coatings do have a life expectancy.

This paper has two objectives:

- (1) selection of a paint and coating contractor;
- (2) inspection of the coating process, including the final product.

The above two objectives are related to the paint/coating of oil and gas installation facilities in the field.

INTRODUCTION

Paint and coating technology is a dynamic, moving force. Each year the industry develops new abilities and methods in utilizing new raw materials and refinements to already existing formulations. Each individual coating, by the very nature of its formulation, has certain characteristics and attributes which enable it to perform well within a given range of conditions on specific surfaces.

After the correct product has been chosen for a particular environment, the human factor comes into play. Selection of a competent coating contractor and the inspection of that contractor is the formula to success.

I. SELECTION OF A COMPETENT CONTRACTOR

Selection of a competent coating contractor is 50% of the equation of the success of the coating or painting job. The quality of the contractor that you employ to do a job will have a direct relationship to the quality of work you will receive. But how do you select a contractor? What are you looking for, and is the lowest bid always the best? The name of the company will generally tell you.

1. What is in a name? The name of the company will generally tell you what their emphasis and expertise is: Joe's Roustabouts, Bill's Paint and Antique Shop, etc.. Does your prospective contractor specialize in coating and paint, or is it just a sideline business and not a specialized, concentrated effort?

2. Contractors should have the following:

- A. A Master Service Agreement
- B. Certificate of Insurance
- C. Rate Sheet

3. Safety program. The contractor should have a comprehensive safety program including written procedures, standards, and provide regular on-going safety training.

4. Safety equipment and personal protective equipment on the job should be strict. They should have the following:

- A. Self-contained respirators
- B. H₂S monitors and carbon monoxide testing equipment
- C. All field personnel should be certified in both H₂S and the use of respirators.
- D. Fire extinguisher
- E. Adequate water and oil traps
- F. Blast hose couplings wired shut
- G. Protective clothing (hoods and gloves)

5. Drug testing.

6. Who runs the company? Is it a small or large company? Find out who is the supervisor of the job, and find out who is in charge when he is not present. Does the coating crew get on-the-job supervision every day?

7. Are there any language barriers? Communication is very important, not only for safety's sake, but also to make sure the job is proceeding according to specifications. In West Texas, there can be language barriers and communication breakdowns between Hispanics and English speaking people.

8. Check out referrals from current customer lists. Ask if they are satisfied with service and quality overall. Also, find out the size job a contractor can do. There are a lot of very good contractors that can do a one to five day job very well. However, they may not always be able to handle larger jobs. Most large contractors are too expensive for one to two day jobs.

Be sure that you get a commitment from the contractor that once he starts the job, he will stay on it until it is finished. You need the contractor to state a completion date, barring weather and unforeseen complications. There can be the problem of pulling crews off of one job to get another job finished. Just be sure that your job has priority and is not the one suffering.

9. Contact the coating supplier. Ask the supplier if the contractor is in the store often and if the contractor keeps up with the industry. These business people will probably know more about the contractors than anyone. Do they pay their bills?

10. Does the contractor belong to NACE, SSPC, or any society to up-date and keep abreast of the industry? This is more important today than ever.

11. Ask the contractor if they own any inspection tools, and which ones they do have. If they do not have any tools, you need to question them further. The possibility does exist that the contractor has never been inspected. Contractors who have not been previously inspected will probably not have inspection tools. This does not mean they are not or could not be good contractors. However, at this point in time, I would be skeptical if they did not own any inspection tools, or have never been inspected.

12. If your prospective contractor is defensive about inspection, you should be concerned. The end result is that it is for his protection as much as for the owner's protection and the main objective is to receive a quality job. If you only have one contractor in the area, inspection of the job will increase the quality of the job tremendously. It is definitely in everyone's favor.

13. Going with the low bidder. You get what you pay for. The price should be a secondary consideration. Good, quality contractors will earn their pay. I believe the best way is to choose three or four qualified contractors and let them bid. But, be suspicious if the low bid is lower by more than 20%. Most good contractors will be within 10% of each other.

14. Always take a look at the condition of your contractor's equipment. It should be well maintained. Remember, they are in the painting business -- if they do not maintain their equipment, will they respect yours?

Now that we know what to look for in a contractor, let us go on to the other 50% of the equation for success.

II. THE INSPECTION

A. Specifications

The inspector's most valuable tool is a good specification. The specification should address the extent of inspection, test methods, the actual inspection, range of acceptance or rejection, responsibility and state the inspector's authority.

The inspector should acquire, read, and understand the coating specifications. Any aspects not understood should be clarified with the specifier or owner. The specifications should contain the following information and criteria:

1. Pre-job conference. This should include the following: safety on the job; any unusual situations such as H₂S, ladders, scaffolding; inspection prior to cleaning (sandblasting, water-blasting, etc.); the cleaning operation application procedure -- materials and material handling; inspection procedures.
2. Coating schedule. This is a specific list of exactly what is to be coated and where it is located.
3. Workmanship prior to surface preparation. Surfaces to be coated should be carefully inspected to identify any surface contamination or surface defects; defects must be repaired; weld spatter must be ground off; areas hard to coat, such as skip welds, rough welds, sharp corners, and laminated steel, must be located and repaired.
4. Materials. Only the specified materials should be used. They must have proper storage. The shelf life should be known. The batch numbers should be recorded. The correct volume solids and mixing instructions should also be known.
5. Work schedule. This should include the order in which various phases of the work will be done: surface preparation, coating, inspection, final report, etc..
6. Surface preparation. Either the NACE or SSPC standards should be followed.
7. Application. Is it to be brushed, rolled, air sprayed, airless sprayed? The thickness of wet film or dry film should be known. The inspector should ensure workmanlike manner and dry film thickness that is specified.
8. Inspection and reporting. What test is to be performed and when is it to be performed? What instruments are to be used? Understand the procedure, inspect the job and report it in written form.

The inspector will almost invariably be required to provide his employer with some record of his inspection.

Much valuable information on the durability of coatings and the economical protection afforded by them is lost through poor record keeping, or no record keeping at all.

While many organizations do keep records, sometimes the records are of little real value in determining the protection afforded and the cost of

protection per year. The records should show all items involved in the cleaning, pre-treatment, application, and materials for a coating job.

An important part of the inspector's job is maintaining regular communication with the owner's representative and contractor. In addition to daily conversation on the job, that communication takes the form of regular reports and meetings. Exactly what kind of reporting is to be done by the inspector should be specified in the coating specification or developed during the pre-job conference. As we have mentioned, a common understanding of specifications is assured during the pre-job conference. Reporting may include:

- a. A daily written report using standardized forms.
- b. A less detailed weekly report.
- c. A weekly progress meeting.
- d. An inspection log or notebook used to record all inspection activity.

B. Surface Preparation

The surface preparation will vary according to the environment and coating system used. It is estimated that 70% - 80% of all premature failures are attributed to improper surface preparation. Surface preparation should include:

1. Inspection of surface to be coated
2. Inspection of fabrication defects
3. Pre-cleaning
4. Cleaning

C. Methods of surface preparation

There are many which include: solvent cleaning, hand tool cleaning, power tool, and pickling, which are all inclusive of the non-abrasive blast cleaning. Our main concern will be abrasive blast cleaning to a NACE #2 near white or SSPC SP-10-82 Standard. This finish will be free of all oil, grease, dirt, mill scale, and 95% of the surface shall be cleaned to a white metal. When using abrasive blast cleaning, the compressed air should be checked to make sure it is free of oil. A white cloth can be placed over the nozzle or hose to check for remains of oil or water. This should be done prior to blasting and periodically during the process. Cleanliness can be checked visually or with an ultraviolet light.

D. Anchor pattern or surface profile will be checked by using two instruments.

1. Replica Tape is a tape that is rubbed on the blast-cleaned surface which provides a mirror image of the profile.

2. Spring Micrometer -- the replica tape is inserted between the anvils of the spring micrometer and a measurement of the surface profile or roughness is obtained in mils. You must remember to subtract 2.0 mils for the thickness of the tape. The tape can be stored for future reference.

E. Environmental conditions

We know that environmental conditions play a significant role in the quality of abrasive blast cleaning and painting. The surface temperature, ambient air temperature, dew point, and relative humidity should be verified prior to starting, through the coating application and initial cure.

1. Sling psychrometer -- an instrument to obtain the relative humidity, dew point and ambient air temperature. The ambient condition should be taken before work each day and periodically through the day. The surface temperature should be a minimum of 5° higher than the dew point temperature or condensation will take place.
2. Surface temperature thermometer -- allow the thermometer to be on the substrate surface at least 3 minutes for an accurate reading.
3. U. S. Weather Bureau Tables -- a set of tables to determine the relative humidity and dew point temperature. If you do not know the exact barometric pressure, use 30" of barometric pressure.

All of the readings should be recorded along with the date and time.

F. Coating application

The mixing, thinning and application of all paint and coatings should be closely monitored to ensure that the requirements of the specifications and/or specification of the material manufacturer are fully complied with. All batch numbers and manufacturer SKU numbers should be recorded. A wet mil gauge should be used to tell the applicator the amount of coating or paint being applied while wet, in order to assure correct dry film thickness.

$$WFT = \frac{\text{Desired dry film thickness}}{\% \text{ solids by volume}}$$

$$WFT = \frac{\text{Desired dry film thickness}}{\% \text{ solids by volume} + 100\% + \text{thinner added}}$$

The applied coating should be visually inspected for faults such as runs, sags, orange peel, light areas and heavy areas. The specifications should

include requirements for repair and touch-up of defective or damaged areas.

G. Inspection of the applied coating or paint

Using a calibrated, film thickness gauge, each coat must be inspected to verify the thickness of the dry film. The procedure described in SSPC-PA-2 shall be followed to measure dry film thickness. The number of readings shall be made to assure thickness requirements have been met. No less than one reading per 25 square feet should be taken. The readings should be made with a dry film test instrument (non-destructive) Type I (magnetic pull-off) gauge. This gauge is used to obtain non-destructive measurement of non-magnetic coatings applied to a ferrous metal surface. Verify the calibration of the gauge before, during and after used. It must be used in accordance with calibration standard SSPC-PA-2.

There is one caution during inspection and repair. Everyone needs to be aware of the manufacturer's requirements regarding "critical re-coat time" and surface preparation after that time has been exceeded.

H. Pinhole, thin film and Holiday Detection

An electrical Holiday inspection should be conducted after the application of the final coat, particularly for internal immersion surfaces.

1. DC low voltage wet sponge Holiday Detectors operate on less than 95 volts and up to coatings of 10 mils or less in thickness. A wetting agent can be used on coatings from 10-20 mils in thickness but this method is not recommended on coatings over 20 mils.
2. High voltage Holiday Detectors should be used on coating systems in excess of 20 mils. The rule of thumb is 100 volts per mil of coating, but the manufacturer should be contacted on this procedure because excess voltage will damage a sound coating. Also, caution should be taken as a spark can ignite any flammable products or gas in the area.

All Holidays and thin areas should be marked with chalk and repaired by applying additional coating. These areas should be inspected again for defects. Again, all of these procedures should be recorded with date and time for the final report.

Coatings that will be placed in immersion service should be fully cured in accordance with the manufacturer's recommendations prior to being put into service.

CONCLUSIONS:

Selection of a competent paint and coating contractor can save the end user or owner not only a lot of money, but also a lot of time. In the oilfield, time is money.

Properly implemented inspection can also be a great help to the coating contractor by identifying poor practices and problems early on so as to eliminate expensive "re-do's".

Inspection is a key element for achieving successful performance of paint and coating. However, effective implementation of the inspection procedure is strongly dependent upon the strength of the specifications.

BIBLIOGRAPHY

KTA-TATOR, Inc., Coating Inspection Instrument Handbook

NACE, International Coating Inspector Training and Certification Program

NACE Coating Inspector Training Program
Practice Piece Inspection Report

Ambient Conditions		Date	Time	Date	Time	Date	Time
Air Temp	*F						
Wet Bulb Temp	*F						
Relative Humidity	%						
Steel Temp	*F						
Dew Point	*F						

Inspector _____

Surface Preparation

Pre Inspection Comments

Defects Corrected

Pre Cleaning Method

Comments

Abrasive Blasting

Type and Grade of Abrasive

Specification Standard

Abrasive Checked for: Cleanliness

pH

Anchor Profile Measurements

Min Max pH Test Hrs left uncoated Comments

Coatings

COAT #	PAINT MANUFACTURER'S NAME AND DESCRIPTION	BATCH NUMBER	APPLICATION METHOD	COLOR	D.F.T. BEFORE THIS COAT	W.F.T. MEASUREMENTS	MIN	MAX	DFT MEASUREMENTS	MIN	MAX
1											
2											
3											

COAT #	MIXING	THINNING	STORAGE	HOLIDAYS	DEFECTS/COMMENTS
1					
2					
3					

Figure 1