Comparison of Dry-Blast and UHP vs. m-jet® (UHPAB)

By: MEAUX Surface Protection

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Customers:

Anadarko-SMI 268

Stone Energy-EC 46

MEAUX

Member of the Mühlhan Group

HISTORY MADE IN THE GULF OF MEXICO WITH *μ-jet* TECHNOLOGY

Anadarko
South Marsh Island 268 A

Meaux Surface Protection (MSP), a member of the world wide Mühlhan Group performed the first offshore job in a Gulf of Mexico production platform, as well as in the world, with μ-jet technology and achieved very good results. Offshore platforms in the Gulf of Mexico range in distance from one mile to over one hundred miles away from the coastline of the United States. These production platforms produce, gather and process oil and gas. These platforms have an immense amount of sensitive equipment onboard, as well as their own living facilities, heliports, communications equipment and some times a large staff in charge of operating the facility. Due to the environment in which they are located, it is obvious that maintenance painting is necessary in order to stop and prevent corrosion.

The preferred and traditional method of surface preparation has been conventional dry blasting. The obvious problem that this method of surface preparation is the dust generated while blasting. Dust has a way of getting into sensitive areas of rotating equipment and is a nuisance to personnel onboard the facility. Until μ-jet, it has been nearly impossible to eliminate the problems created by dry abrasive blasting. The problems created by dust contaminating lubrication oil, or by spent abrasive damaging bearings, can range well into the hundreds of thousands of dollars. With μ-jet, MSP has been able to eliminate the problems created by dust or spent abrasive. At the same time, μ-jet only utilizes 50% or less abrasive than conventional dry blasting operations, thus reducing transportation costs for materials as well. Another advantage of μ-jet is that in areas where abrasive cannot be used, like compressors, generators, etc., we can convert from μ-jet to Ultra High Pressure (UHP) operations. UHP has been able to replace sponge blasting, soda blasting and conventional blasting because it eliminates dust during surface preparation, but, it does not create a new profile and production rates are much slower.

Project Description:

Our goal was to prepare and protect 22,150 square feet of steel on a structure, located about 30 miles into the Gulf of Mexico, in the South Marsh Island Field. The complex consists of two (2) 8-pile platforms, one produces oil and gas and the other structure is outfitted with compressors, generators, separators and other equipment that processes the oil and gas from this field and from other adjoining fields.

Our work assignment was to blast and paint the process equipment located next to all of the rotating equipment on the process platform, and to prepare and paint the rotating equipment without shutting down the facility or damaging the equipment. Damaging or shutting down the facility will not only cause production from this field to be lost, but also production from other fields.

The existing coating on the structure had exceeded its expected life and it was failing in some areas due to age. Some areas had 14-16 mils of paint; some areas were down to zero due to mechanical damage or steel replacement. Overall, corrosion was starting to progress at an unacceptable rate.

Process Platform

Challenges:

Dust created due to normal blasting and painting operations was not acceptable on this project. It was not acceptable because of the rotating equipment in the area and because of the amount of activity from platform personnel in the area. All of the equipment is monitored and maintained constantly by Anadarko employees to ensure that oil and gas flows without interruptions.

Utilizing abrasives that produce very little dust, but that have to be recycled in order to be cost effective, were looked at. The challenge with these abrasives was the amount of man-hours that would be required to contain the work area and to capture the spent abrasive for recycling purposes.

UHP was also considered for the project. Limitations on the amount of water available on the platform for this process, and being able to achieve a surface preparation and a surface profile that would provide for a long life of the new coating, along with the process being cost effective, made us decide to limit UHP to areas where other surface preparation methods were not acceptable. Rotating equipment like compressors, generators and cranes were pulleys, cables and bearing do not get along with abrasives, these areas were prepared with UHP.

Anadarko wanted to make sure that the job was performed to the best standard possible, making sure that the steel was free from corrosion, chlorides, and that an anchor profile was achieved, to ensure adhesion, and provide the longest life possible for the new coating.

Rotating Equipment Before

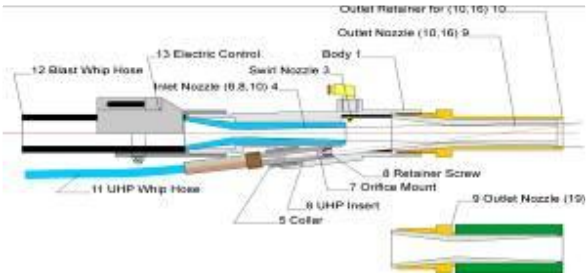
Rotating Equipment After

Selection of Surface Preparation Method:

After taking into account all of the expectations from the customer, and the financial constraints for the project, it was decided that μ-jet was the preferred, and most economical means of surface preparation, along with selective use of ultra-high water blasting.

μ-jet utilizes conventional blasting technology, it combines it with UHP to create a process that is more efficient and virtually dust free. The secret is in the patented nozzle that μ-jet utilizes to combine old technology with new technology.

μ-jet TECHNOLOGY



Staffing of project:

A six-man crew (6) was mobilized to perform this work. The crew consisted of one foreman, three blaster/painters and two helpers. One spread of equipment, composed of one UHP unit, one 8-ton blast pot, one after cooler, one 900 CFM compressor, one tool house with support equipment and two portable water storage tanks.
The crew was to work 12-14 hours per day, 7 days/week. Crew changes were scheduled weekly, with 50% of the crew being rotated every week. The customer employed a full time inspector to assist us with quality assurance and logistical support at the facility.

Project Execution:

The crew's first order of business was to familiarize themselves with the facilities, survey the work site, select an area where to locate the equipment on the facility and to create Job Safety Analysis' for the operations that we were going to perform. The next day, equipment arrived on the platform and the personnel started to work.

1. A typical workday starts out at 6:00 am with a morning safety meeting. This meeting allows for communication between production personnel and contractors in order for everyone to be abreast of each other's operations for that day and to ensure that there will be no conflicts between jobs during the day.

2. Our crew will review the applicable JSA for the work that is going to be performed and any other issue that may have come to light during the meeting with operations personnel.

3. After the safety meeting, the crew will inspect the work area and the equipment to ensure that nothing has changed overnight from the day before. After the inspection, the crew will start to perform the activities for the day.

4. If the activity is to blast, the crew will normally blast until 2:00 or 3:00 pm, depending on daylight and weather conditions. After the blasting is completed and approved by the inspector, the steel is primed.

5. Once enough area has been blasted and primed, the blasting operations are stopped and the steel is prepared for a stripe coat, second coat and topcoat.

6. Anadarko's specifications call for different topcoat colors between process equipment and structural steel. Process equipment is top coated gray; structural steel is yellow.

Once we started to μ-jet process equipment, it was noted that we were spending energy removing all of the coatings even though the primer coat was in good condition. The inspector at the site made the decision to perform the surface preparation on a spot and sweep basis. The areas that were showing rust were blasted to a near white standard, the areas where the exiting coating was in good condition was swept until sound coating was exposed.

Blaster performing μ-jet

Performance:

The crew was able to produce a total of 22,150 sf with 4080 man-hours. From this square footage, 19,000 sf were prepared with μ-jet and 3150 sf with UHP. This equates to a production rate of 5.43 sf per man-hour. Out of these 4080 hours, 12.55% of the man-hours are non-productive hours (weather delays, operational delays and crew change hours). Taking these hours into account, actual production rate for the crew is 6.21 sf per man-hour.

We are able to perform a comparison between UHP and μ-jet performance on this project. Separating the hours used for each type of surface preparation, we find that making the cost of surface preparation for μ-jet 1 / sf the cost for UHP is 2.12 / sf. This is for surface preparation only; it does not include rigging, painting, cleaning, etc.

If the surface that was being prepared was structural steel only as opposed to process equipment with a large amount of flanges, nuts bolts, etc., we are confident that μ-jet would be even more cost efficient. At this time, we are excited to see that an area where equipment protection would have increased the price of the project significantly, or alternative methods of surface preparation would have been necessary in order to reduce the risk of damaging rotating equipment, μ-jet performed the job at the same or lower cost as conventional blasting and without containment.

Anadarko was considering the utilization of sponge-jet as the means of surface preparation, on average; this process can be 200% to 250% higher than conventional dry blasting, or more if it is necessary to create containment areas in order to recover the abrasive for recycling purposes.

The utilization of hours, on a percentage basis is as follows:

- 4% is utilized for safety meetings and planning.
- 19% is utilized for rigging. This category is higher than normal because we have to protect finished product in order to avoid over-spray from different colors of finish coat.
- 23% cleaning. Special attention is being given to ensure that abrasive is not left on the deck just in case there is an operational upset that can contaminate the spent abrasive with oil and thus create hazardous waste.
- 15% performing surface preparation.
- 26% painting.
- 1% weather delays.
- 10% operational delays.
- 2% crew change.

Abrasive consumption has been 2 pounds/sf.

Potential Areas that can improve performance on this project:

Top-coating all of the steel with the same color. This will eliminate having to protect finished product in order to spray the next color. This platform is being finish coated with yellow for structural steel and gray for process equipment.

Summary:

The feedback from the parties involved was as follows:

1. Personnel on the platform were pleased with not having to deal with dust issues and potential damage to their equipment.
2. Management was pleased to hear that operations personnel are satisfied and to see that the project was performed within budget. The cost was comparable to normal blasting operations, in areas where rotating equipment protection is not an issue.
3. The inspection company was pleased with the surface preparation that was achieved, the anchor profile was acceptable (2.5 mils) and the chloride content on the steel was almost non-existent.

4. The paint manufacturer performed pull tests on the primer, as per ASTM-D4541, in areas where μ-jet was utilized. All of the dollies failed at 600 lb+, no paint was removed.
5. From our company, we are pleased to provide a service that is second to none and cost effective.

We are all excited to see the potential for this technology in the Gulf of Mexico. Our customers who have not had an opportunity to try this new technology are inquiring about it, as well as paint manufacturers. MSP is constantly setting up demonstrations at onshore facilities in order to expose customers, paint manufacturers and inspection companies to the benefits of μ-jet.

If you have any questions or would like more information; please contact us at our office in Lafayette, LA, our phone number is 337-989-4109.

Finished Product

Stone Energy
East Cameron 46

Scope of Work:

The scope of work on this project was to blast and paint a total of 16,000 sf. EC 46 is a 6-pile platform; we were to paint the six legs from the +45 to the waterline, the waterline and the boat landing. The legs were to be dry-blasted, the waterline and the boat landing were to be prepared utilizing µ-jet. We estimate 4,000 sf of legs and 12,000 sf of waterline, including the boat landing. From our visual inspection, it appears that all of this area was painted with the same coating system.
The project was completed in 28 days, utilizing a 5-man crew. The distribution of hours, on a percentage basis, is as follows:

Comparison by Work Code

Work Code	Dry Blast	µ-jet®
Safety	3.85%	3.77%
Rigging	13.55%	16.40%
Cleaning	8.16%	12.07%
Blasting	41.96%	25.65%
Painting	25.40%	31.44%
Weather	0	6.04%
Delays	5.39%	3.12%
Other	1.69%	1.51%
Total	100%	100%

Safety:

This category will almost always run about the same cost, 4% of the hours based on a 12-hour day. We utilize 0.5 hours in the morning to hold a safety meeting on the activities that will be performed that day. The only way to minimize the cost impact of a daily safety meeting is to work more than 12 hours per day; this brings this category down on a percentage basis.

Rigging:

These categories are very close despite the different type of rigging utilized in each area. The legs were worked utilizing spider baskets, the waterline was worked utilizing cables and boards type rigging. However, when we analyze this category on a production/man-hour basis, we see that moving a spider every time that a new area is going to be worked on is more time consuming than rigging cables and boards. The production rate of rigging and moving a spider, on this particular project, was 45.45 sf/mh. The production rate of rigging cables and boards and moving the boards as needed was 73.61 sf/mh; this was 61% faster.

Cleaning:

On this particular project, cleaning appears to be faster when dry blasting, but it is not the case. With µ-jet®, it is necessary to rinse the blasted area in order to remove the spent abrasive that will adhere to the steel due to it being wet. When we dry blast, it is necessary to blow down the blasted steel in order to remove the dust. The production rates cleaning were 75.47 sf/mh for dry blasting and 100 sf/mh for µ-jet. When a dry blasted area is cleaned utilizing air to blow it down, it is some necessary to go over the same area more than once because the dust will migrate to areas that have been cleaned already. With µ-jet, we start washing from top to bottom and it is not necessary to do it more than once. On this particular project, the abrasive was allowed to fall into the water.

Blasting:

This category is where the value adding capacity of µ-jet is realized. The distribution of hours shows that 41.96% of the time was utilized to dry blast the legs, as opposed to

25.65% of the time utilized to μ-jet the waterline. We can see a savings based on the percentages, however, we look at the production rate per man-hour and we see that dry blasting produced 14.70 sf/mh and μ-jet produced 47.05 sf/mh. These numbers show a 220% improvement on the blasting speed. The abrasive consumption rate was 15 lbs/sf for dry blasting and 8.66 lbs/sf for μ-jet. Utilizing less abrasive per square foot supports how the production was increased. The only variable that we cannot account for on this particular comparison is that the legs were blasted from spider baskets and that the waterline was blasted from cables and boards. Again, our experience shows us that working from cables and a board is more productive than working out of spiders. Despite this, we can see that the increased production and the reduction in abrasive consumption prove that μ-jet is more effective than conventional blasting. The coating that was being removed was well adhered on this platform.

Painting:

The distribution of hours under this category is fairly close, 6% difference. When we look at the production rate per man-hour, we see that painting from cable rigging is faster than from a spider basket. The production rate on the waterline was 58% higher than on the legs.

Weather, delays and other are categories that we have very little control over. The total for these categories was 7.08% during dry blasting and 10.67% during μ-jet.

As we look at the total project and pull out the productive hours (rigging + cleaning + blasting + painting) we can see that 89.07% of the hours during dry blasting were productive and 85.56% of the hours during μ-jet were productive.

Cost Comparison /sf for surface preparation

Category	Dry Blast	μ-jet®	Savings
Labor + Equipment	1.69	1	69%
Abrasive	1.76	1	76%
Total	1.73	1	73%

The overall cost per square foot was 26% higher for the dry blasting portion of the work (including paint and consumables). μ-Jet is more productive, however, there is more equipment involved and this increases the cost per man-hour, but it is evident that we cannot compare cost/man-hour alone and get a true comparison.

When comparing μ-jet to dry blasting, we must take into account the increased production during the blasting phase of the project and the reduction in abrasive consumption. Increased production will shorten the duration of the project, thus reducing the amount of hours necessary to blast and reducing other expenses (housing, inspection cost, support cost, etc).

A few more advantages of μ-jet are that it is dustless, thus eliminating the potential to damage sensitive equipment. μ-Jet removes chlorides from the steel, this will make the new coating system last longer. μ-Jet leaves a profile free of dust, thus giving the new coating a better surface to adhere.