

ACHIEVING FM PRODUCTIVITY

An extensive research project in deepwater
offshore fabric maintenance productivity





It's Taken 10 Years to get 20 Years behind in Fabric Maintenance

April, 2024

One of the most challenging problems left to be solved in deepwater oil & gas production is that of managing corrosion. Currently, fabric maintenance programs in the Gulf of Mexico find themselves behind schedule in blasting & painting operations. As one Operator put it, **"It's taken us 10 years to get 20 years behind"**.

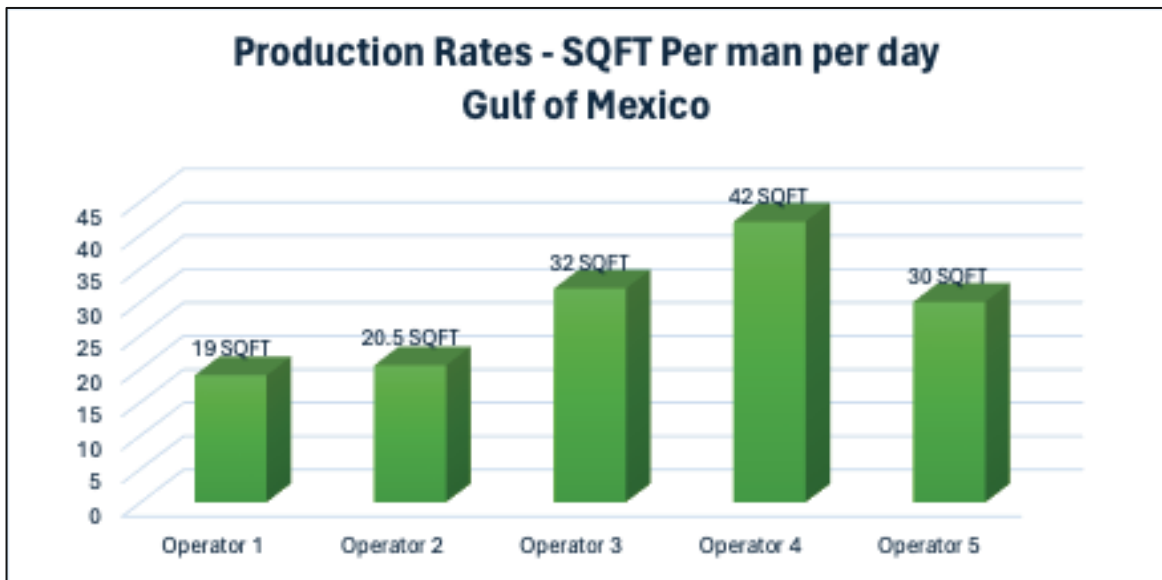
During the recent COVID pandemic, personnel-on-board (POB) for manned assets were restricted to critical operations staff only. This pandemic period severely restricted oil and gas Operators' ability to carry out their fabric maintenance campaigns as planned. Furthermore, Operators found themselves struggling to keep up with maintenance painting schedules even before the pandemic. Combined with retirements, lay-offs and the many reorganizations during and post COVID, a great deal of institutional and practical knowledge has been lost over the past several years. Notwithstanding these challenges, high commodity prices have amplified the urgency to make up lost time on asset integrity programs. Additionally, life-extension programs for existing platforms have added pressure for maintenance teams that are tasked with protecting, preserving and prolonging asset life.

The following paper is **the most complete fabric maintenance data set, ever to be compiled for deepwater Gulf of Mexico**. The author's intent is to offer insight and ideas on how deepwater Operators can improve performance and productivity in their maintenance painting programs. The information contained herein was obtained from multiple internal and external sources including contractors, sub-contractors, suppliers and operators. All sources used to prepare this information operate in deepwater Gulf of Mexico.



DOLLARS & SENSE

With a high level summary of the challenge identified, we move our attention to the metrics. Notably, production rates tabulated by square foot, per man, per day. During the research for this paper, it was recognized that many parties had very little awareness of what their production rates were when expressed in square feet, per man, per day. This lack of information could be attributed to the data being confidential, unavailable, or simply tracked by another methodology. Furthermore, it was uncovered that even fewer companies track this information by crew/contractor (when multiple crews were employed), by coating system (when multiple coating systems were used), or by block/campaign work as compared to chase work. The chart below demonstrates a 55% variation in square feet, per man, per day and gives us an **average of 28.7 square feet, per man, per day**. It's important to point out that the lower figures seen in the chart were a composite of block/campaign work and chase work, while the highest measurement was purely block/campaign work. Most companies contacted for this research do not track production rates for chase work separately, but all data sources agreed that square feet, per man, per day would be in the single digits. This is primarily attributed to the significant time associated with access and containment to prepare and paint areas that represent less than 10 square feet per area.



DOLLARS & SQUARE FEET

Another metric used to calculate fabric maintenance productivity offshore is cost per square foot, or in other parts of the world, cost per square meter. Because this work is focused on deepwater Gulf of Mexico, all of the work presented here will refer to cost per square foot. While preparing this paper, it was interesting to find that cost per square foot calculations were generally known among companies throughout the value chain. Despite that, these figures were more difficult to obtain than the previous figures of square feet, per man, per day. Admittedly, **cost per square foot figures are highly protected pieces of information**, particularly among service contractors.



DOLLARS & SQUARE FEET, Cont'd

While cost per square foot seems like a very straightforward calculation, it was found that there is a large variation and general lack of consistency as to how these numbers are achieved. Some companies included beach-side project managers and support staff in their figures, while others excluded them and coating inspectors in theirs. It was also disclosed that many companies do not account for re-work in their calculations. Furthermore, it was documented that only one company tracks this information by crew/contractor (when multiple crews were employed). On top of that, there was not one company surveyed that examined statistics by coating system (when multiple coating systems were used). In other words, **two-coat paint systems and five-coat paint systems all went into the same calculation** without consideration for how the overall figures would be contaminated and valuable productivity information lost. As an industry saturated with data collection, we have the information, we should exploit it. Unsurprisingly, the Operator with the lowest cost per square foot in this chart, was the one that most closely tracked metrics noted later in this paper. These performance indicators allow for clear productivity ranking between coating systems. Recommendations on how best to approach this can be found at the end of the paper.



EYE ON THE PRIZE

Prior to reviewing further productivity data, we will cover another area dealing with costs per square foot, namely, paint costs. Operators routinely spend a good deal of time and money vetting manufacturers and multiple coating systems for their assets, including comprehensive audits of their quality processes. These qualifications are derived from NORSOK M-501, ISO 12944-9 or AMPP TM 21612-2022, all of which are accelerated destructive testing standards. These standards focus solely on the as-applied performance of a paint system, not the speed or ease of application. **In other words, we test a new car by parking it in the driveway to see how it looks after a few months.** We never drive the car to see how it handles, how fast it accelerates or even if the radio works. Once a paint system has been qualified and written into a specification, the industry assumes its just as good as the other systems on the specification.

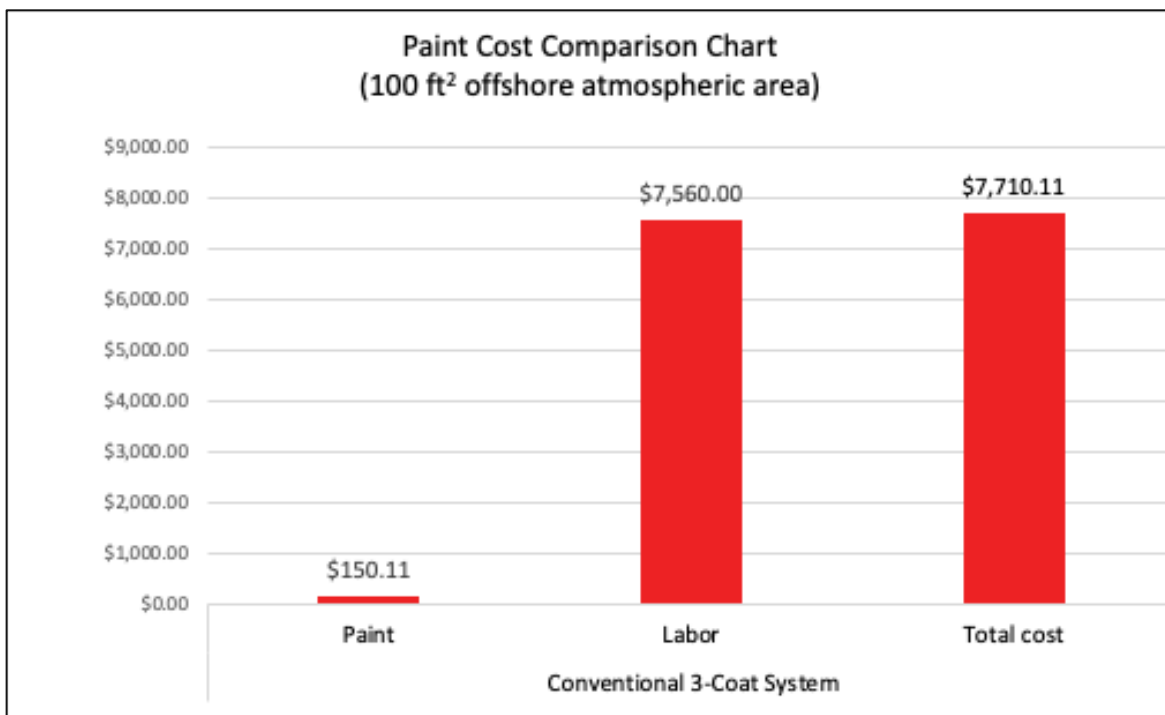


EYE ON THE PRIZE, Cont'd

Herein lies a challenge. If a group of paint systems meet the minimum threshold to pass the test requirement then, there are no stand-outs, because the standards only grade on a pass/fail criteria. In contradiction with the ultimate goals of corrosion control, this drives commodity formulations to be just good enough. Particularly when there is no consideration given to application characteristics or efficiencies. With these thoughts in mind, how does our industry improve?

All that to say, paint costs are often thought to hold the most opportunity for cost reduction strategies because all systems are qualified the same way. However, the chart below shows the cost breakdown between a conventional 3-coat paint system and the labor cost to prep and paint 100 square feet on an offshore platform. **Paint costs represent roughly 2% of the total.** So even a significant drop in paint costs, say 50%, wouldn't move the needle.

Keeping our eye on the prize, let's continue on in the research and see what can be learned about productivity.



Paint costs assume a traditional 3 coat system of epoxy mastic, epoxy mastic and urethane topcoat as of Q1 2024.

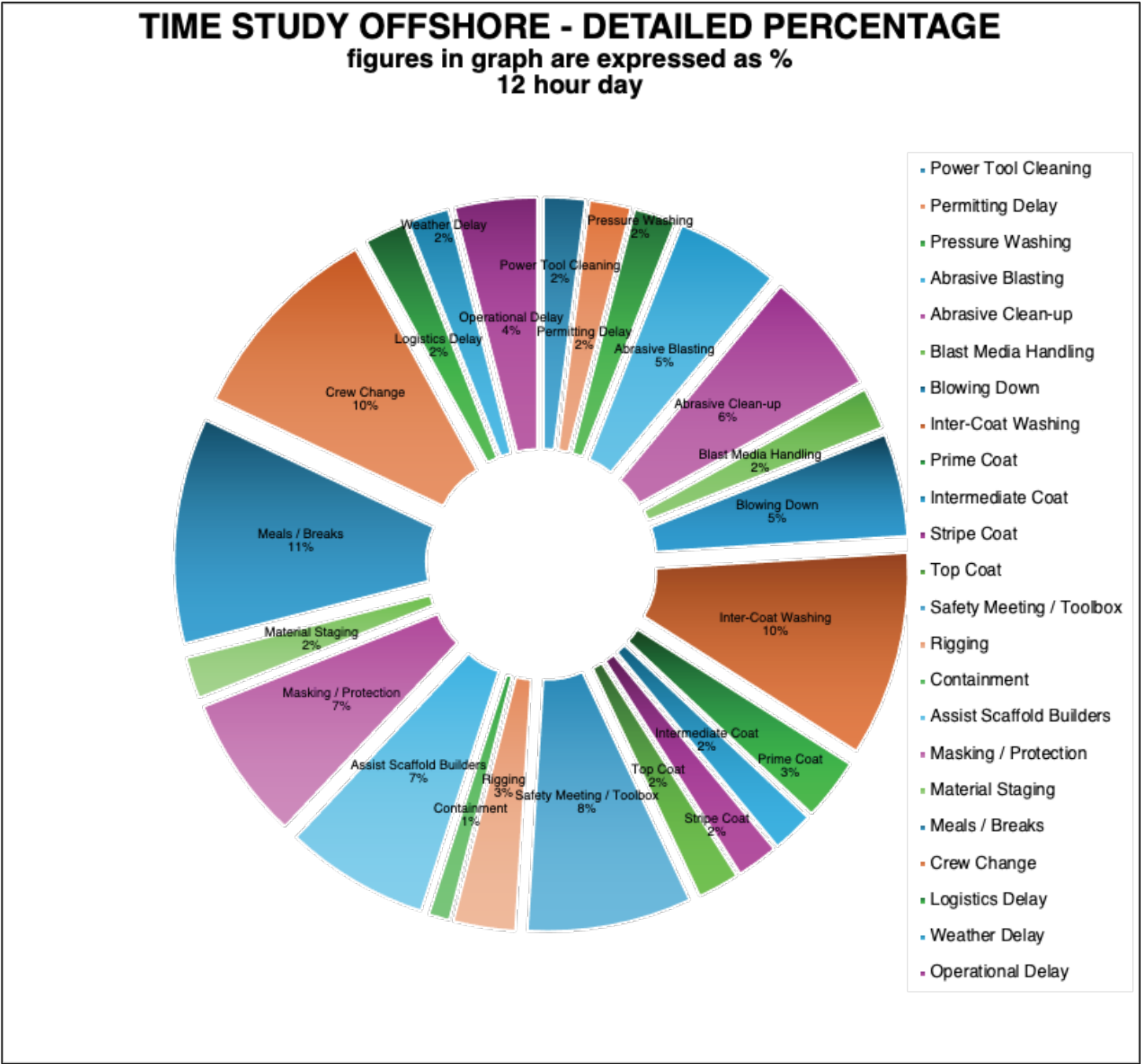
BY THE NUMBERS

Operators and contractors have various ways of tracking productivity. These methods range from the very simple to highly complex. For the moment, we shall put these calculations aside and look at a broader view of abrasive blasting & painting operations offshore.



BY THE NUMBERS, Cont'd

More specifically, a figure that is often overlooked, **Time-on-Tools (TOT)**. Some years ago, an Operator in the Gulf of Mexico undertook a project to quantify and categorize all of the time spent for their blasting & painting crews. The graph below is instructive as it illustrates the blocks of time associated with each task.



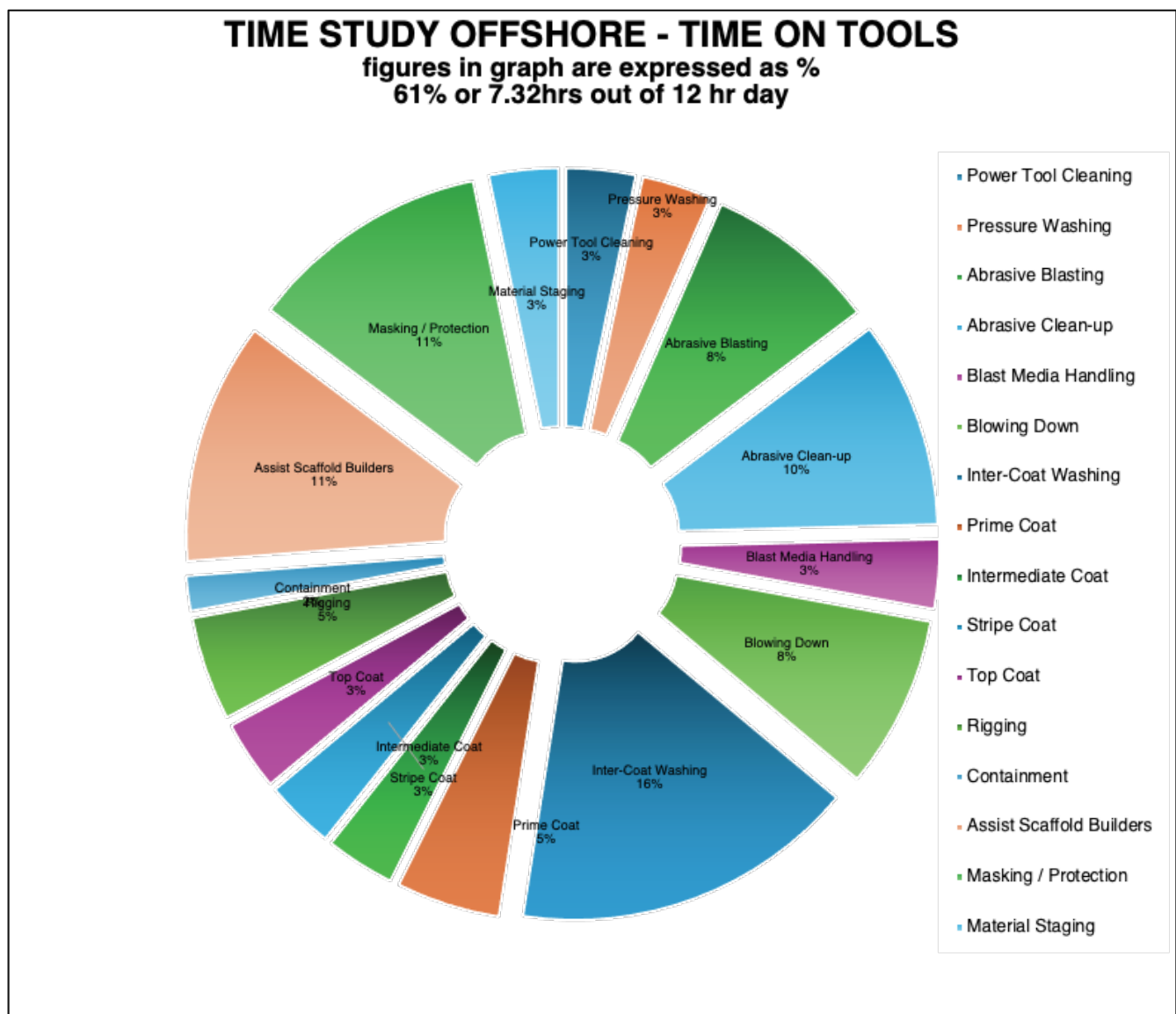
BY THE NUMBERS, Cont'd

Furthermore, as the figures are further refined, we focus the blocks of time that are distinctly associated with Time-On-Tools (TOT). The categories removed from the graph below are as follows:

Permitting Delay
Meals / Breaks
Logistics Delay
Operational Delay

Safety Meeting / Toolbox
Crew Change
Weather Delay

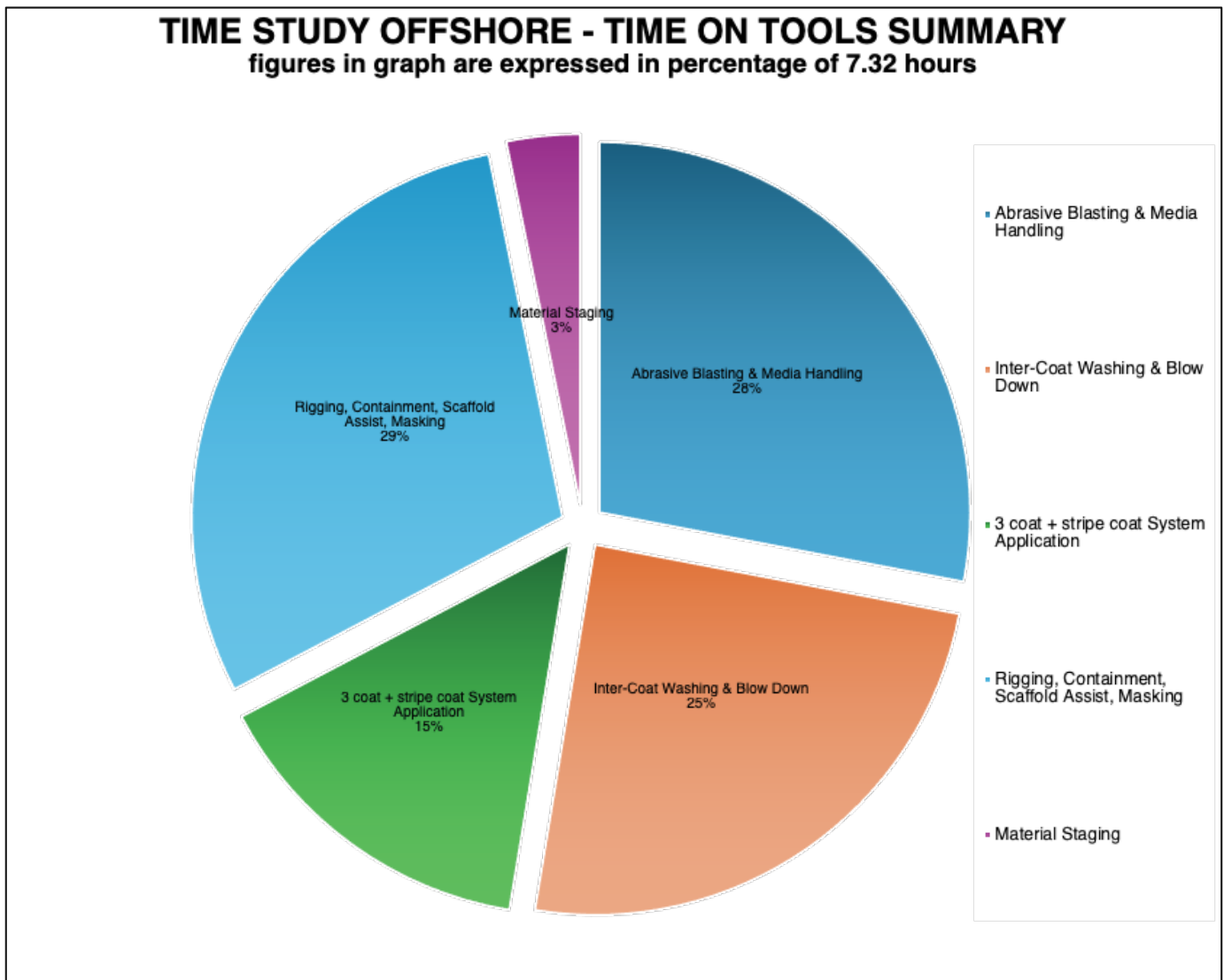
With the above categories removed from the data set, the figures reveal **an average of 7.32 hours of Time-On-Tools** out of a 12 hour day. In other words, only 61% of the time spent offshore for blast & paint crews is impacting fabric maintenance progress and contributing to productivity. The authors of this work are aware of a single “best-in-class” scenario in the GoM with an average TOT of 8.9 hours but this was a short duration project and could likely not be replicated on a consistent basis.



BY THE NUMBERS, Cont'd

In the final graph from the offshore time study, the TOT operations are further combined into similar categories to enable a high-level summary. For the authors of this work, the summary graph below told a much more insightful story than did the 7.32 hrs per day of TOT. While the rough breakdown between surface prep and application aligned with what one would expect for blasting & painting operations, the portion that was the most thought-provoking was the Inter-Coat Washing & Blow Down category. As this category is solely attributed to chloride decontamination (water washing) and drying of areas coated the previous day(s) in preparation for a subsequent coat. In other words, if all coats could be applied in a single day or a single visit, a **33% improvement in productivity would be immediate** while reducing inter-coat contamination. Additionally, making use of vapor blasting and/or Ultra-High Pressure Water Jetting (UHP or WJ) as compared to dry abrasive blasting could improve productivity while reducing dust contamination in rotating equipment and abrasive media waste.

Ideally, we would be able to reorganize some of our practices offshore to increase Time-On-Tools. However, it's likely that a concerted effort would lead to minimal gains in actual TOT. That being said, a review and assessment of the current work processes that make up TOT would yield significant gains as mentioned previously.





SUMMARY

In summary, our challenge is to control and reduce corrosion using the most productive and cost efficient methods possible, acknowledging that the most productive scenario is to employ coating systems that last longer and reduce the need for painting overall. However, this topic is beyond the scope of this work and will be explored further at a later date.

Many of the technologies needed to develop oil & gas fields in deepwater didn't exist when those fields were initially discovered. Much like single-visit coating systems didn't exist until the past decade. Recognizing that nearly every item on an offshore platform must be prepped and painted several times during the life of the asset, our goal should be to learn from the past while employing more effective technologies to control corrosion.

This project was born from a desire to help propel the industry forward with useful data. Acknowledging that the result of this research was quite unexpected and distinct, we offer the following key points in summary:

- Fabric Maintenance programs have experienced a significant loss of institutional knowledge over the past few years.
- Creating & standardizing productivity benchmarks for crews and coating systems for fabric maintenance is paramount
- Production rates calculated by square feet, per man, per day are highly variable but average 28.7
- Costs per square foot can be far more useful with refined data collection
- Labor is the primary cost driver for fabric maintenance, paint costs are near 2%
- Time on Tools = 7.32 hours on average out of a 12-hr day
- Inter-coat washing and blow-down represent for 1/4th of all Time on Tools.
- Single-visit coating systems improve Time on Tools by 33%

RECOMMENDATIONS

As the final portion of this work, we look to engage the industry in varying approaches to best manage the challenges identified by this research. If the deepwater fabric maintenance industry were a mighty oak tree, our aim has been to tap many of its branches for ideas. While not an exhaustive list, we are hopeful that you find the recommendations helpful, thought-provoking and perhaps even easy to implement in your FM program.

INSTITUTIONAL KNOWLEDGE GAP

Going back to the introduction of this paper and one of the earliest findings in our research, we cover the loss of institutional knowledge. This stems from frequent internal reorganizations where seasoned employees are reassigned to other roles, as well as the decades of expertise and learnings acquired by mature employees that are not passed along to new hires. This is also observed during work planning and execution. Experienced crew leaders that plan their work flows and communicate those plans and goals to their crews are far more efficient and effective. However, this work flow planning is not formally taught, but picked up over time. Furthermore, we instruct new employees on “what to do”, but what gets missed is the “what not to do”. This important chunk of knowledge is typically passed down by word of mouth, from person to person. This knowledge gap has been identified in degreed and professional fields, as companies often assign seasoned employees to mentor new employees. The same and perhaps even more effort should be placed on this knowledge capture in the skilled trades, recognizing that the average age in our industry is going up. Therefore, a recommendation is that every new hire should have a mentor, a seasoned employee that can share his or her wisdom with the youngest in our craft. Furthermore, a fabric maintenance training center should be formed and jointly funded by the industry to train and certify blasters and painters for the unique challenges of offshore painting.

DATA COLLECTION & BENCHMARKING

This section offers probably the widest range of approaches for implementation. It's likely that your company already collects sufficient information to get this framework off the ground. To start, you'll need a couple of data buckets. One for block/campaign work and one for chase work. Separating these into two categories will make the data calculations easier and more reliable if you split them early on in the process. This information can come from work orders, time sheets, inspection reports or internal systems and could easily be compiled by an intern. Now that you have an idea on where to get data and how to segregate it, let's examine what details we need. At this point, there is likely more information available than can easily be digested. So, let's start simple; with projects that are already completed and ideally less than 1 year old.



RECOMMENDATIONS, Cont'd

DATA COLLECTION & BENCHMARKING, Cont'd

This will ensure that the data is fresh and relevant. Find the completed square feet of the project, man hours billed, and material costs (including abrasive, paint, PPE, etc.) and length of time to complete the job in days. At this point, you will need to decide whether beach-side project management, support staff and coating inspectors will be included in your man hour calculations. The author's recommendation is to start simple and only include the paint crew or POB assigned to that project, don't overwhelm yourself. The easier the inputs are, the more consistent the data will be. Make sure that you create a legend in your spreadsheet that identifies what is, and what isn't included in your calculation. This will become very important as time goes on, contrary to Hondo Crouch's famous quote of "You can't forget memories", it's easy to forget what you've calculated in your formulas if you don't note it. Now that you have four primary data points, square feet completed, man hours, material costs and number of days, you can run several calculations.

$\text{Square Feet Completed} \div (\text{Number of Days} \times \text{Crew Size}) = \text{Square Feet, Per Man, Per Day}$

$(\text{Man Hours Cost} + \text{Material Costs}) \div \text{Square Feet Completed} = \text{Cost Per Square Foot}$

Once you are comfortable with these calculations, you can begin applying these to each crew and each paint system. The goal in creating this data is to analyze it for patterns and anomalies. You may notice one crew is far more productive than another, this crew may be a good candidate as a mentor for other crews. It can also be used to identify individual crew members that are prepared for leadership roles. Additionally, you may notice a difference in productivity using a particular paint system. This productivity jump would be important to understand and implement across the FM program. Furthermore, these calculations allow the operator to have far better visibility with their FM program budget and projections. It can also be used to hold under-performing contractors accountable while increasing productivity among the broader crew landscape by publishing a score-card to introduce a competitive spirit into the program. Keep in mind, in all of the calculations above, contractor re-work should not be included in the productivity figures but should be tracked separately for accountability benchmarking.



RECOMMENDATIONS, Cont'd

TIME ON TOOLS

As discussed earlier, labor figures are by far the largest cost driver in FM programs. Identifying areas where we can accelerate and amplify the number of square feet completed per hour should be a primary goal. As this increased square footage for the same man hour reduces our cost per square foot. Procurement agents of times past had the low-hanging fruit and could look at single line items in budgets and try to negotiate prices down. Today, labor costs are heavily influenced by the speed and ease-of-use of paint systems. Focusing on a line item in a budget and not employing total installed cost per square foot calculations are causing us to keep doing the same things over and over again.

Based on the research of this paper, we are forced to complete all work offshore with only 60% attributed to Time on Tools. That is very near being asked to complete a task with one hand tied behind your back. Recognizing that there is likely very little that can be done to increase the Time on Tools, we must focus on ways to boost productivity in the time we have. As mentioned previously, this study revealed that one-fourth of the Time on Tools was consumed by washing things and drying them off in preparation for the next coat of paint. A painless approach to get that 25% back is to stop washing and drying surfaces every day by using a single-visit coating system. That is to say, a complete coating system that can be applied in a single day or in the absence of that, to specify systems that reduce the number of coats from 3-5 to 2 coats. This easy approach will yield significant results almost overnight. Even saving a single coat from a conventional three-coat system (which usually results in 5 coats including stripe coats) can literally save days.

THE RIGHT TOOLS

In closing, we would be remiss if we didn't also mention proper tooling for the scope. In our experience offshore, it is common to see crews working with equipment designed for large projects attempting paint a tiny area. Imagine using a 2-gallon paint pot to use a thimble full of paint and all the clean-up and waste that a situation like that creates. Notwithstanding the challenging access created by bulky equipment. Employing the use of "chase kits" reduces clean-up time, improves work quality and drastically improves chase team productivity. These kits are designed to improve productivity offshore, it's recognized that much of the time spent by chase crews is associated with the clean-up and maintenance of application equipment that is too big and cumbersome to be used for chase work. Since this paint work typically consists of repair areas that are less than 10 square feet (1m²), it doesn't make sense to use the same tools and equipment used for campaign or block work. Properly designed "chase kits" make use of smaller more manageable equipment that can be deployed in under a minute and can be cleaned in seconds without the use of solvents. When used in conjunction with 1 quart kits, chase crews can get more work done faster.

KEY ELEMENTS OF A SUCCESSFUL FABRIC MAINTENANCE PROGRAM

- Retain experienced people in program management while mentoring new hires at the crew level.
- Plan and communicate workflows from project management to crew personnel prior to project execution. Workflows should document more than just what is going to be painted but also how it's going to get painted and when.

RECOMMENDATIONS, Cont'd

KEY ELEMENTS OF A SUCCESSFUL FABRIC MAINTENANCE PROGRAM, Cont'd

- Segregate block/campaign work from chase work for benchmarking purposes. Chase work should be considered anything under 10 square feet of surface area coated. Track chase work by number of instances not square foot productivity.
- Track re-work as number of incidents and square footage by paint system and crew. These reports can uncover underlying process and or execution problems. Re-work can be a hidden budget killer as it ultimately subtracts for the productivity measure.
- Creating & standardizing productivity benchmarks for crews and coating systems for fabric maintenance is paramount. These figures can improve productivity by publishing the figures and introducing a spirit of competitiveness between crews. As mentioned earlier in this work, the Operator with the lowest cost per square foot in this study was the Operator with the most comprehensive benchmarking and data dissemination scheme.
- Making use of single-visit Wet on Wet systems improve productivity by 33% immediately. Choosing a two-coat system instead of a three-coat system will significantly improve productivity.
- Correctly selecting tools for the appropriate purpose, like chase work tool kits that are right-sized for small repair areas.

CONCLUSION

It is recognized that there is much work yet to be done in the arena of corrosion control related to offshore Oil & Gas but it is the authors hope that you found something of value in this paper. If you have questions or comments or are interested in enlisting Tesla's help in your fabric maintenance program, please visit our website for more information at www.teslanano.com.



RISK FREE

Plain English

GUARANTEE

For a new application of Tesla's 2x1 Wet Edge atmospheric paint system, Tesla will guarantee a 25% increase in productivity as compared to a traditional 3-coat atmospheric paint system or we'll pay for the paint.

The terms are simple. Provide recent invoices for your current paint system for pricing verification. Coordinate with Tesla on training, area of application, and productivity figures. If we don't beat your current installed cost per SQFT or SQFT per man per day figures by at least 25% using our 2x1 Wet Edge system, you'll get our paint for free.

- 25% increase in productivity - GUARANTEED
- Tesla 2x1 Wet Edge for the same cost as your current 3-coat system
- Money back guarantee



Photo credit: WRANews



TESLA
NANOCOATINGS