Water is the True Grit of the 21st Century.

Reducing Mountains of Waste to Handfuls

Text of Dr. Frenzel's Speech "Water is True Grit!"

Welcome to the World of Water Jetting.

In the world of corrosion control, it should be obvious to everyone by the end of the day that the job is to get the surface clean enough to accept the paint system.

It should be equally obvious to everybody here that blasting a surface with grit/sand produces a surface full of contaminants.

If you screw up and don't produce a clean surface, the world will move elsewhere. **DO a GOOD JOB; the world will beat a path to your door.**

Dr. Lydia M. Frenzel Executive Director Advisory Council

It is not so obvious that the criterion is NOT what the surface looks like, but whether it will accept a paint system. IN the conflict between cosmetics and performance, the winner is on the side of the performance profile.

Today is the first day of your new life. I GUARANTEE you will not leave here today as the same person. I GUARANTEE that you will be changed.

Why are you here? If you have been using dry abrasive all your life, you may not want to hear this. I was invited to share a few ideas on philosophy. I am Dr. Lydia Frenzel, chair of the SSPC/NACE wet blast committees since the beginning of time. Many people know me as the Water Witch of the West. I'm here to **"Hammer Home the Truth about Water."** I want to share with you my years of observation, investigation, and experience. I HAVE COME TO THE CONCLUSION that:

"WATER IS TRUE GRIT."

Believe me when I tell you that I didn't start out with that in mind.

Remember when a hundred pounds per square inch was too much pressure for san blasting and before that time, no one even wanted to blast steel. Don't tell me it was that long ago because I'm not THAT old.

There has been a lot of change and there will be a lot more. Are you part of this future?- because if you are not- you are history!

Expectations for the quality of surface preparation in coatings have escalated in the past few years. Change increases exponentially. This is the trend of the future. Preparing for change is preparing for the future. Today as you participate in this coatings session, think of the future of your business. If you adapt what you see and hear to your particular needs, you will be part of the future.

Make the most of this time. The Advisory Council is a non-profit organization that exists to assist you in educating and influencing your clients. Take notes and ask questions. Don't hesitate to call me at the Advisory Council for more of the REMINDER CARDS or if you have questions.

You will go out today wanted to try waterjetting. OR you will go away absolutely certain that Lydia is craze. But I hope that you will go out to try waterjetting because I want you to be part of the future. I want you to be successful. If you adapt what I am saying to your particular business, you will be part of the future.

We are all afraid of trying something new. Part of our hesitation in maintenance industry is that MISTAKES COME BACK TO HAUNT US. I want you to be comfortable about the water jetting process changes. Understanding the process will enhance your bottom line.

Today I am also going to talk about OBSTACLES and OBJECTIONS. An obstacle is something that stands in our way, but is not so tall or imposing that we do not expect to overcome it. An objection reaches high to the heavens. By definition, an objection is something we have formulated to be insoluble. That is the critical difference between obstacles and objections.

Be on the lookout for **obstacles** that are formulated as **objections**. That is where the fields will be fertile. Love your enemies for their lists of objections. Without them, you could never discover all of the obstacles that you can overcome. Besides are any of us so arrogant as to believe that we can tell someone that something is impossible? **Let's leave objections to the GODS**.

The market place will select the businesses that they perceive will help them overcome their obstacles, or solve their problems.

Now I am going to tell you how to overcome obstacles and avoid objections.

WASTE

Do you think this country works smart? Do you know what the largest single industry in this country is? It's the corrosion industry. And it's dedicated to waste!

This was the finding in 1975 when metallic corrosion cost the United States $82 billion annually or 5% of the gross national product.

Now, twenty years later, today, right now Battelle, found this situation unchanged in 1995 when they reported that metallic corrosion costs the US about $300 billion a year. Approximately 100 billion dollars is avoidable. Now do you really think that we're working smart?
(Reference, Material Performance, June 1995, p.5)

No one collected that 100 billion dollars. That could have been YOUR profit and we would have saved our steel!

The situation is unchanged even though we believe we have had 20 years of continual improvement. This doesn't sound like any improvement at all to me.

There is a better way to do things than what we are doing traditionally. And if we had effective language to describe what we are trying to achieve, we wouldn't be having some of these problems. And we might not have to waste all this money.

There is a new revolution, an evolution in surface preparation which is occurring right now. **IF YOU ARE NOT PART OF THIS FUTURE, YOU'RE HISTORY.** But I want you to be part of this future. I want YOU to be successful.

The PIPEYARD STORY

You all paid your dues somewhere, somehow. I paid my dues in the oil patch...I stepped over a lot of hungry alligators in the Louisiana swamps. I learned that it was hard to remember that the objective was to drain the swamp when I was up to my ass in alligators.

Now way back once upon a time, I was a sweet young thing, ... the drilling superintendents asked me to go to pipeyards and find out why their pipe was rotten. When it arrive on the drill site, often looked like two threaded ends connected by a cylinder of rust. I was out in the pipeyards looking at thousands of joints of drill pipe that had been exposed to salt. The drill pipe and casing range in size from a few inches to a few feet in diameter and are racked on wooden or concrete runners. There may be tens of thousands of joints of pipe on one yard. Some of these racks are as long as a city block and twice as high as I am. This pipe represents millions of dollars in inventory. It is a resource that has to be clean, defect free, and ready to ship out to the drilling site on a moment's notice.

At first I followed the pipe yard managers around looking at beautiful racks of varnished pipe. In one corner of the yard massive, automated brushing and cleaning equipment was usually running. Giant rotating brushes burnished the outside and giant steel bottle brushes reamed the inside. It was about the size of the old steam locomotive which used to deliver the boxcars behind my father's hardware store. Dust, dried drilling mud, and old varnish drifted downwind in clouds. The diesel engine was deafening. The vision was inspiring, or at least I was impressed by it all--which was what it was supposed to do, I guess.

After dutiful inspection, the pipe was coated with the varnish or shellac and put into storage. **That pipe looked gorgeous**. ——

For days, I walked around the pipeyards with the proud manager while he admired his handiwork. For two to three weeks, the manager would strut around and say, "Look how good I am taking care of this pipe." BUT a few weeks later, I would be back to the same pipeyards with my hammer in hand. I selected a piece of pipe. I banged on that piece of pipe with my hammer and sheets of rust-impregnated varnish fell off. When I looked down the inside of the pipe, there was a corresponding clump of rust and varnish.

I straightened up, thinking the yard manager was going to give me one of those "AHA!" looks and say, "By golly, we'd better find a better way to clean this pipe. It's already rusting!"

Instead, he drew his walkie-talkie like my cousin used to draw his pistol to shoot a snake, and called back to his office. "Damn it, Boudreau," he said, "get those guys out here and brush this rack of pipe again. Tell'um to get it clean, this time!"

A little while later, the diesel was roaring, old varnish was flying, and those marvelous machines were reprocessing this particular rack of pipe.

A few weeks later I was back on the yard with the yard manager. I took my hammer out, and banged on some pipe on that same rack. New sheets of rust-impregnated varnish

fell off. When I looked down the inside of the pipe, there was a corresponding clump of rust and varnish.

Once again, I stood up expecting the manager to give me one of those "AHA!" looks and say, "By golly, we'd better find a better way to clean this pipe. It's already rusting!"

Nope. He drew his walkie-talkie again and called back to his office. "Damn it, Boudreau," he said, "get that machine out here and brush this rack of pipe again. Tell'um to get it clean, this time!"

In those days, I was glad to have a hammer with me for more than one reason. Since I was the only woman and I was telling the managers something they didn't want to hear. I left a hammer in every pipe yard. I seeded pipeyards in Louisiana, Texas, Oklahoma, and Mississippi with hammers. The managers had a worried look on their faces. The walls had lost enough thickness or were **pitted** to the point of needing repair. I felt that I was Hammering home the TRUTH.

Now you need to understand that this pipe was generally racked on a third party service yard. The brushing crews came in as contractors and followed all the bid specifications. The inventory manager followed procedures which had been established through practical experience. Every one covered their assets by following the established procedures. No one took responsibility for the whole job of cleaning and CONSERVING the steel. **THE STEEL kept corroding under the VARNISH**. They had simply brushed off the superficial dirt and mud to meet a VISUAL Appearance. They weren't dealing with the *INVISIBLE* contaminants. No one had told the steel that if it looked so pretty and successful, it wasn't supposed to rust. **I kept wondering when was the yard manager going to say AHA?** I kept waiting for the light bulb to come on.

I knew there had to be a better way. I developed a water borne chemical to stop pitting and salt corrosion. It was not a coating, nor did it look pretty. I produced the NAKED pipe look. It was appallingly ugly, but the steel didn't rot away. SO the Naked pipe look was sold for several years to more intelligent companies who could bear the ring of truth. It didn't sell to companies where the owners were distant from the inventory and who inspected their pipe from air conditional limos. Companies who wanted performance and economics, not prettiness, were the ultimate customers.

I BECAME FAMOUS FOR SOLVING THE WRONG PROBLEM. I thought that they wanted CORROSION control, to decrease life cycle costs, to increase the longevity of the pipe. I was thinking in terms of surface preparation. But THEY wanted PRETTINESS.

EVENTUALLY I FIGURED THAT OUT and came up with an oil field answer. One day, I was walking by the docks and saw some shrimpers dipping their nets into a black coating to keep the cord from being frayed and the knots on the nets intact. It was perfect for the pipe yard. This black coating penetrated, was flexible, and water resistant. It looked black, shiny, and uniform, and ABOVE ALL ELSE, it was cheap. .... So I found the manufacturer in New Orleans and invented BLACK GOLD. That's what we called it. It was every manufacturer's dream- take 55 gallons, add ten drops, and increase the value by 10 times.

Today we would call it a surface tolerant coating. Black GOLD penetrated the steel and rust and did a better job of gluing the rust to the surface than anything else out there. It would harden at night, but would soften and self heal during the daylight in the Southern exposure, and glistened black. The yard manager would have the owners inspect the pipe just before lunch- in the heat of the day from the air-conditioned cars- so they could then be taken for a free lunch. When I hammered on the pipe, the rust didn't fall off.

I was sorry to report to the drilling supervisors that the pipe would still be delivered rotten, but at least it would be pretty.

That was when I was stumbled into Water Jetting and water blasting. I already had a reputation as an expert in surface preparation in the traditional sense. WATER is the **secret** ingredient.

Audience Experience

I always poll my audience to see what methods you have used or observed.

How many have USED WATER in any form or fashion IN SURFACE PREPARATION??

Low pressure water cleaning- <5,000 psi, (340 Bar) economical

High pressure water cleaning, 5-10,000 psi, (340-680 Bar) used with and without abrasive, fairly economical

High Pressure water jetting > 10,000 psi (700 bar) - 30,000 psi. (2000 bar) At that pint water becomes supersonic. Coatings come off the surface. Productivity increases.

Ultra-high Pressure (UHP) WaterJetting > 30,000 psi (2000 bar). Productivity is really up. Almost every type of coating is sheared off to bare metal

Air/water/abrasive equipment-. Lots of different configurations from air/abrasive streams in which water is introduced to systems where abrasives added to the water stream.

Okay, I see that you are pretty evenly distributed in your experience. A few years ago, most people did pressure washing and only a few people had seen high pressure water jetting.

APPEARANCE VERSUS SUBSTANCE

Let's talk a little bit more about appearance. Why hasn't this industry embraced water jetting?

Surfaces processed with methods using water don't look the same as surfaces processed by the traditional methods. Traditional methods make the surface shine. AND Americans cling to the LOOK of SUCCESS. We embraced the heavy chrome bumper regardless of the engine under the hood. As a nation, the American culture embraces the LOOK of SUCCESS, not necessarily performance.

Making a beautiful looking surface is a substitute for substance and performance. The beautiful surface of the pipe fulfills every person's wishful thinking. It looks pretty and successful.

Let us remember that it was a **band** of men in ragged uniforms who defeated the British Army during our revolution. The British Army certainly was an organization dressed for success. As Americans, we should remember that we once valued performance over appearance.

When we get back to our roots, a revolution is easier than reform.

Surface preparation is evolving now to include water. Water looks like the truth. Water Jetting REVEALS the naked truth and HISTORY of the Surface. I share with you that TRUTH is a necessary ingredient.

Three driving forces

WHY complicate your life with water.

Europe and many of the Asian communities are ahead of the United States in adopting water for surface preparation. The reform has already taken place. Companies need to stay competitive in the world market.

Good things come in threes. I think of this as three legs holding up a stool- If you don't have all three legs- you fall off.

Let me share with you THREE outside forces that push us towards adopting water- with and without abrasive. Contractors in the US are not using water because they are welcoming or embracing a change. They are considering water because outside pressures are forcing them to do things differently.

The three forces are environmental restriction, health and safety issues, and economic constraints.

The First Force is **Environmental Restrictions.** In particular environmental constraints on dust, amount of grit, and disposal are forcing a change in attitude.

The Second Force is the issue of **Health and Safety.** The reduction on respirable dust and lead based paint removal is a direct benefit. When the amount of dust is reduced by wet abrasives (or slurry) blasting, the worker can see easier. That sounds simple, but it prevents accidents.

The Third Force is **Economic Constraints**. There is no grit to buy, clean, or dispose of. Trades can work side-by-side in dry-docks. Critical engines, bearings, and shafts can be repaired in the same vicinity. Painting can take place nearby without fear that the solid particles will be trapped in the coatings. This leads to faster turnaround times.

These are forces that **push** us towards water.

One force that **pulls** us towards water is enhanced performance. There is a performance advantage in the coating lifetime and adhesion. Contractors and owners ought to be embracing water for this reason alone. This future is the direction for success. I guarantee that I wouldn't be here today if I didn't want you to be successful. THE BENEFIT OF PERFORMANCE isn't a compelling reason by itself.

We have looked at the three forces that push us and one force that pulls us to the use of water because water and abrasive are extremely important. Let us first examine a major OBJECTION in acceptance and implementation before we get to surface preparation.

COMMON Language- Development of Standards

One of the objections, if not the major OBJECTION, is a lack of specifications. But that is a false OBJECTION- I saw it as an obstacle. It is now reduced to an OBSTACLE because we have consensus language.

The Lack of consensus Standards leads to this kind of language. **Hydroblast** the Redwood Deck. or **Hydroblast** the Steel or **HYDROBLAST** with these water pistols. In one instance, you are using low pressure water cleaning: in the other, high pressure water jetting; in another, triple action water jetting pistols.

How important is good consensus language in everyday life?

Where's THE BEEF?

I was on my way to give a talk about 200 miles from home. The meeting coordinator had told me **how** to get there. Get on Interstate-5 and get off the Coalinga Exit. Turn left and you will see the Harris Ranch. You couldn't miss the Harris Ranch. After all, it is all by itself in the middle of a vast desert. Several other people had also said, just get off on the Coalinga exit- you can't miss it.

Now I was looking forward to eating supper at a place renown for their Beef. My husband was driving while I worked on slides and notes. So we got in the car and drove south and got off at the Coalinga exit, and turned left in the

middle of nowhere. I looked up. I was looking at nothing but dust...no oasis, no pool, no restaurant ..just dust...Just as it was described. I patted my husband's knee and said- There's a truck with Harris Ranch Mud flaps. Let's follow it. We followed the truck right up to the Raw Material supplies. Thousands of head of cattle were standing in a cloud of dust waiting patiently to become our supper. We looked at one another and were not quite ready for supper on the hoof. My husband asked the guard at the gate of the feedlot for further specifications on the location of the Harris Ranch Center.

So we went back to Interstate 5 and headed south. We got off at the Huron, Visalia, Langmore, and Hanford exit- nary a word about Coalinga, and turned left. We stopped at the Harris Ranch restaurant, the Harris Ranch pool center, and finally the Harris Ranch Center where the talk was to be given. I wouldn't admit that we were lost, but we did seem to be going around in circles. **What** I was trying to accomplish was to get 1 mile east from Interstate 5 on state highway 198. Everyone was telling me **how** to get there from their point of view. No one referred to a map that is the "Third Party Standard" of consensus language.

In the same way in our field, if there is no Third Party Standard, the project manager or owner doesn't have an acceptable language to use as reference. The Contractor doesn't have a defined goal. The Coatings manufacturer doesn't know what is expected for coatings warranty. EVERYONE is afraid to take the initiative to use a new process. NEW PROCESS- I have to laugh at this feeble **obstacle**. Shell in the Netherlands has used water blasting since the 1960's. But the coatings maintenance industry still project, as an OBJECTION, a NEW process after 30 years.

The lack of Standards was an objection. It needed to be addressed. As chairperson since 1985, it took a lot of talking and persuasion for a "NEW" process. It took ten years to get a standard accepted and published.

Standards organizations provide the grounds for consensus documents, that is, documents that are defined as a "general agreement" or a "majority of Opinion." Consensus recommended practices provide a **Common Language to describe problems.**

Information managers recognize that no matter how good an idea, no matter how promising a product, if it cannot be understood in a standardized conceptual framework, then it cannot succeed in the market place**. In other words, there must be a common language in order to conceive of a continuous improvement initiative**.

Let me repeat. There must be a common language in order to conceive of a continuous improvement initiative. If an industry is to promote competition that moves towards improvement in products and services, there must be a consensus on the conceptual framework within which improvement is defined. This is your engineering work procedures. The better this framework, the faster this will happen.

The lack of a Third Party Standard is an OBJECTION, even though it was a FALSE OBJECTION, because it was solvable. That's how I knew it was an **obstacle** to be overcome. I recognized it as a fertile field for improvement.

NOW that OBJECTION has been removed in the United States maintenance industry. The National Association of Corrosion Engineers and Steel Structures Painting Council have a Standard for high pressure water jetting. NACE No. 5- SSPC SP-which was issued in October 1995.

The Standards OBJECTION NO LONGER EXISTS, and has been demoted to an OBSTACLE. But I meet people who now claim that the variety of standards is an OBJECTION. This is silly; just choose the one that is applicable to the project. This is a small obstacle to overcome.

We are all afraid of trying something new. Change is not a comfortable topic but it is necessary. We are all afraid of trying something new. WHY- MISTAKES COME BACK TO HAUNT US. No one remembers the million square feet of coatings that are done correctly. They only remember, and hear about, the five square feet that failed. When you try something new, you want to be sure that you understand how to go about it because understanding the process will enhance your bottom line.

You are part of the future if you have integrated water into your practice. Many contractors are fighting this, because they don't have the equipment and the expertise. Those contractors will fight contractor who do have the processes that use water by raising OBSTACLES.

When I advise people about writing engineering standards or procurement documents, I advise them to describe **What** the final result is- not **HOW** to do it. Does it really matter if you use a toothbrush to clean the surface as long as the final performance result is achieved?

Tell **what** you want t achieve, not **how** to do it. Give me the map coordinates for the conference not **HOW** to drive to the feedlot. Develop your in-house engineering work procedures for the details on how you achieve this within your organization.

Writing Specifications

A good set of specifications will keep you from going hungry. THREE viewpoints must converge in bid specifications and they must all be represented.

The viewpoints of the

- **owner/operator**.
- **contractor**
- and **coatings manufacturer**

This may seem obvious but it is an often-neglected principle.

This surface preparation revolution is occurring because coatings manufacturers have recognized the secret and success of water in dealing with invisible salts.

The coatings manufacturers have really understood that water is the true grit of the 21st century. The Coatings manufacturers have come forward with videos, pictures, and rewriting their specifications so that surfaces can be cleaned with grit and/or water. WHY- because you have been forcing the guarantee for a good job on the coatings manufacturer.

The owner or operator wants a job that is perfect and will last forever at the lowest price. They often want to avoid planning decisions that involve specifications but the owners have the responsibility and the authority.

The contractor will not accept responsibility unless someone says, "MY coatings will work over this surface." The coatings manufacturers ultimately guarantee their coatings performance. It is to the advantage of the contractor to work with the coatings manufacturer to force some of the responsibility back to the owner/operator.

The most universal way to work with the owner, specifier, and coatings manufacturer is to get the bid specifications written with the PERFORMANCE goals, WHAT you are trying to achieve- NOT HOW you are going to get to it. I share this, because by the time you get the final bid package, it frequently is too late to say- "I have a different process for removal." Work Together- to write WHAT is to be accepted for visible cleanliness- for anchor profile-, and non-visible cleanliness. When this happens, liability and responsibility is shared.

This is a concept at the management level, bit this concept must be applied to the minute details. It is the KEY ingredient in harnessing innovation to productivity.

These three viewpoints must come together in order for OBSTACLES to be removed.

I know this is difficult. But remember, on the pipeyards, they were all telling the contractor HOW to clean the pipe. The owner was not demanding that they protect the steel from corrosion, as he should have been. The coatings manufacturer wasn't concern with anything but supplying varnish and lacquer at the cheapest price. THEY WEREN'T talking to each other. Ultimately everyone was unhappy. Ultimately everyone was losing money.

Good, Fast, Cheap- You can achieve only two of these three goals on any project. In the pipeyards, they were accomplishing - bad, slow, and expensive - because they were not talking with each other. It wasn't actually a project, just three independent guys covering their assets.

Surface Preparation

Surface preparation concepts are evolving towards an increase in performance expectations.

Ninety percent of coatings failures are traced back to surface preparation. It is the contractor who bears the burden of surface preparation.

We all feel like we understand surface preparation, but do we??

Let me share with you the THREE components for successful surface preparation. Surface Preparation- creating the situation in which the coating will perform as expected. The first two components everyone thinks they know all about.
Visible Cleanliness and Anchor Profile.

The third component, **Invisible Contaminants,** is one that people are still unaware of.

ALL THREE COMPONENTS are all equally important.

While all three are necessary for good coatings performance, it is the last component, the invisible contaminants, that demands water and which requires REFORM.

THE FIRST COMPONENT

The first component- **Visible Cleanliness**- has had many Standards written for it.

Are the coatings removed down to bare metal- a White Blast.

Is there 95% removal with 5% staining- a Near White Blast or Very Thorough Cleaning?

Water and abrasives, or water jetting can accomplish the goals of visual cleanliness. The processes will remove 100% of the coatings or rust layers. BUT Surfaces Cleaned with Water Jetting do not look pretty. They not only have a different appearance, they look ugly.

Ask yourself the question- does the surface have to look pretty in order to perform as a suitable substrate? In fact a 1996 National Shipbuilding Research Program on less than ideal surfaces would suggest otherwise.[1] In this study, panels were conditioned in salt water. Some were then hand wire brush cleaned (SSPC-SP-2) and some were power tool cleaned (SSPC-SP-11).

[1]Evaluation of Coatings Applied on Less then Ideal Surfaces, Sept. 1995, NSRP 0451, The National Shipbuilding Research Program, US Dept. of Navy, Carderock Div. naval Surface Warfare Center in cooperation with Peterson Builders, Inc.

The findings state: "The coatings systems applied over hand wire brush cleaned surfaces performed better than the same coating systems applied over power tool cleaned surfaces. This finding is supported by the fact that five systems,... applied over the SSPC-SP 11[power tool] prepared surfaces failed: whereas, the same systems applied over the SSPC-SP 2 [hand brushed] prepared surfaces had no failures. THIS would be unexpected by most investigators; since, the SSPC-SP 11 [power tool] condition is considered a better degree of surface preparation."

In October, 1995, I heard the verbal presentation of the final report. The investigator was truly puzzled over the results. He was focused on the visible appearance. As soon as I received and read the full report, the answer was obvious. The wire brushed surfaces, under given conditions, had less chloride contamination levels than the power tool cleaned surfaces. The controlling factor was NOT the removal of rust, but the removal the NON VISIBLE contaminants.

Water Jet Standard NACE No. 5- SSPC SP-12 address the both Visible and the Non-Visible Contaminants. As part of our initiative, this represents an improvement in the advancement of surface preparation. It is one of the reasons it took 10 years to get the standard approved and published.

Surfaces cleaned with water or water-abrasive **DON'T LOOK PRETTY. They don't look uniform, nor shiny.** Invariably, the coatings inspector will reject the blast. Get a Pre-start Section and photograph it. The owner, contractor, coatings manufacturer, and inspector should agree on the appearance of visible cleanliness.

I am going to keep repeating this.

Removing OBSTACLES ahead of time will result in fewer lawsuits, less spot repairs, and will result in satisfied clients. Everyone is in agreement, so in a real sense, responsibility is shared.

If you are a company who works all over the world, you need to know the **NOMINAL** cross-over definitions even though the details of the written definitions are different. Each standards society will hold fast to their written standards for visible cleanliness.

For example, WJ-1 is NOMINALLY equivalent to SSPC-SP 5, NACE No. 1, ISO SA 3, and so on.

I keep a table around because everyone has a different set of numbers: NACE, SSPC, ISO, the Germans, and, of course, the French. I have talked to a lot of coatings manufacturers and they all use these nominal cross-over points.

In the Waterjet Standard, we describe performance conditions- clean to bare metal to a matte finish without saying without saying whether to us UHP WJ, HP WJ, HP WC, LP WC, or with abrasives. However, the ISO, SSPC, and NACE blasting standards are specific for abrasive. They tell you no only WHAT to achieve but HOW you are going to do it. If SSPC SP-10 is listed- by default- this is an ABRASIVE standard. The contractor must use abrasives if this is listed as the bid specification. You will need to meet this obstacle early, if you are going to use water.

We started by my telling you that the pipe yard managers were ecstatic with their glistening steel, and later rust scale was falling off. But it LOOKED Pretty. They were doing exactly what everyone else in the industry was doing. It proved impossible to get them to use high pressure water cleaning to process the pipe.

Today, a company in Houston, CRC Evans Rehabilitation uses 20,000 - 25,000 psi water jetting to remove coatings on pipelines at a rate of 1 to 1.5 miles per day. They love the water because it is easy to see cracks and weld defects, and to perform non-destructive testing. It exposes the original profile. They still don't use this process on pipe yards because the owners don't recognize they can save money.

THE SECOND COMPONENT

THE SECOND PART of Surface preparation is the **Anchor Pattern, or profile**. That is the roughness from the peaks to the valleys.

Coatings manufacturers specify the anchor profile in their product literature- IS IT SMOOTH, OR 1-2 MILS (25-50 MICRONS). Can the coating go over heavily pitted steel?

One of the objections is that Water alone can't build a profile! Water alone cannot effectively remove mill scale! It is commonly accepted that water without abrasive retains the surface profile of steel that is under the coating or rust.

Abrasive will change the profile--water doesn't. This OBSTACLE and OBJECTION will come up on every job.

We are talking about using water in maintenance for surfaces that have already been coated or type D steel, salts, or barnacles. We are using water to remove rubber or elastomeric coatings or barnacles, or to wash off the SALTS. NOT ON NEW CONSTRUCTION. IF the profile was good enough for the original material, why should there be a question about the profile for the new coating? You may eventually use water and abrasive streams for NEW construction, but not water alone.

This is an OBSTACLE- We cannot let it become an OBJECTION if there is to be a reform in surface preparation.

Let me illustrate this OBSTACLE. In February, 1996, at New Orleans, new construction paint control panels were stripped by 6,000 psi (400 bar), 20,000 psi (1400 bar), and 36,000 psi (2400 bar) in a demonstration. These were the control panels that had been used in building of a ship. Small black patches, about 0.25 inches (6 cm) were evident

after the coating was removed. These small black patches were immediately recognized as mill scale left on the surface from the automated grit blasting procedure. Everyone agreed that this was okay . Everyone agreed that in new construction, the rate of production through the blast apparatus is the primary factor so often patches of mill scale were left on. So these patches of tightly adherent mill scale were acceptable as part of the new construction process.

Immediately, someone in the crowd raised an OBJECTION- "See Water Jetting doesn't remove mill scale, This surface is not suitable for recoating." Water revealed the TRUTH and HISTORY of the steel. The mill scale was raised as an OBJECTION, when it really is no obstacle at all.

IF THE SURFACE WAS ACCEPTABLE FOR NEW CONSTRUCTION AND USED FOR THE STANDARD CONTROL FOR PAINTING, WHY IS IT NOW NOT ACCEPTABLE FOR REFURBISHING?

I have heard so many FALSE OBJECTIONS that some time it is hard to remember they are just obstacles. You will meet all sorts of OBSTACLES.

ADHESION

Coatings manufacturers have **discovered the secret** that ADHESION is enhanced over profiles which are opened by water as compared to abrasive blasting.

I've come to the same conclusions as Jim Denny, Vice President of International Coatings, when he said at Corrosion96, "ADHESION begins at the bottom of the Pits." It is the experience of International Coatings that water jetting to remove old coatings and rust leaves a surface over which new paint has higher adhesion values.

While the profile measures the same, the cross section is different between water and abrasive cleaning methods. The anchor profile is sharper than cleaning with abrasive, because abrasive erodes the surface from the top down and flattens the surface and traps material. The water cleans from the bottom of the pits up. It leaves the surface open while cleaning out the crevices. Abrasives push the garbage into the bottom of the pits where the coating can not get to it. Abrasive blasting ignores the pits and craters

I think we have covered the obstacles raised in Visible Cleanliness and Profile in enough detail.

THE THIRD COMPONENT

I am now going to look at the third part of the surface preparation -**Non-visible Contaminants such as grease, and salts - and In particular- salts.**

Save Our Steel- I have been saying this for a long time- Save our Steel. Salts on Surfaces- Remember SOS! Water is true grit.

I have been preaching this for 20 years and I am glad to see it is finally catching on. Within the past ten years, soluble salts have been recognized as a major contributor to unexplained coatings failures.

When salts are not present, the steel is properly cleaned. Let's turn this around, The steel is not properly cleaned if salts remain on the surface.

"PROPERLY CLEANED STEEL, free from salts, WILL NOT RUST FOR THOUSANDS OF HOURS, EVEN AT 100% RELATIVE HUMIDITY. .."

That has been established for a long time, but people keep forgetting it.

" "HIGH HUMIDITY as THE CAUSE OF "STEEL RUST BACK," IS FALSE. "

When you get the salts off the surface, the steel doesn't rust during waterjetting. People who use only abrasive will raise this water and steel rusting as an OBJECTION.

"When salts are present, DAMAGING UNDER-FILM CORROSION WILL QUICKLY FORM UNDER THE PAINT FILM, EVEN IF THE CONTAMINATED SURFACES WERE TOTALLY RUST FREE WHEN IT WAS BEING COATED.[2]"

Dr. Gerry Soltz published the data to substantiate these statements in terms that the coatings industry can understand. That doesn't mean that people have universally accepted this, but you can use the National Shipbuilding Research Program data to meet the obstacles.

One of the most idiotic procedures is to blast the steel and quickly paint before it rusts or turns; or to use dehumidifiers to keep the surface from rusting in spotty patterns. That is an erroneous and widespread practice. The appropriate use for dehumidifiers is to reduce flash rusting and maintain dewpoint. All we are doing is hiding the problem before it comes back. This is where the cooperation of the owner, contractor, and coatings manufacturer is vital. At the one year inspection, if everyone agreed on the METHOD, who is going to pay for the repair?

I know about this problem. I called onto a job involving hundreds of rail cars around 1983. These car components were shipped on deck to the US across the Atlantic. Some of the pieces of the steel were heavily corroded and looked like your worst nightmare. The company would blast, and reblast, and reblast. Everything was perfect at the facility. The manufacturing company had the facilities to integrate

[2]G. C. Soltz, "The Effects of Substrate Contaminants on the Life of Epoxy Coatings Submerged in Sea Water," National Shipbuilding Research Program, March 1991, Phone 313-763-2465, p. 6

the component and blast and paint five rail cars inside a huge room with controlled grit, atmosphere, and temperature. They wanted to achieve that perfect job which would last 20 years. Not 1, or 2 year, but 20 years. Three reblasts later, they would paint quickly to seal the surface before the black mottled patterns of active corrosion sites appeared. Within 4-6 weeks of storage on their yard, the same patchy corrosion pattern on the steel would pop right through the coating. This is in 4 - 6 weeks, when the coating was expected to last years. They were doing everything the specification called for- blasting to white metal, using dehumidification to hold the blast, and painting before it turned. BUT the coating was failing within six weeks in atmospheric exposure. In those days, there were no specifications for using water to remove salts. I went over there, and got them to water blast the surfaces. Because that was the problem.

Salts were being driven into the surface during the reblasting procedure. The coating was sitting on the top and the salt was forming corrosion which came right back out. I had to overcome the OBJSTECTION of using water without specifications. Remember SOS-the danger of Salts on Surfaces.

When I looked at the cars under fabrication the appearance of rust could be different on each individual plate. ON one side there was uniform light brown iron oxide as is expected from a clean steel surface with normal oxidation during a humid, Huston night. This is GOOD RUST. The other side was covered with black, speckled, spotty patterns. This pattern of dark black corrosion was weeping from holes in the surface within a half hour of the blast. This is BAD rust coming from individual corrosion sites. It took water to remove the salts before a successful paint application could be completed.

These days we talk about "GOOD RUST and BAD RUST. Coatings manufacturers will let you paint over GOOD rust. GOOD rust is a clean, uniform, tightly adherent, light brown rust- iron oxide- without hidden salts.

Coatings manufacturers don't want you painting over BAD rust. What is this bad rust- it is localized corrosion cells. When you are using water, the dampness on the surface ill allow this BAD rust to form immediately. You can identify the problem areas where the black, splotchy liquid is forming.

Removing invisible contaminants is the **strong point** for water and the most compelling economic argument to use water.

Water is the true grit! It is part of the present, and it is the future.

I have covered the THREE aspects of surface preparation and shown how water fits into toe procedure. This works when the owner, specifier, contractor, and coatings manufacturer write the speciation on WHAT to accomplish, not HOW to do the job.

A contractor can then draw from his experience with different options and equipment to accomplish the task. He can determine during the pre-bid conference, or the pre-start conference, what equipment and methods are best suited to the task. A power washer might be sufficient to remove the coating and achieve WHITE Metal (WJ-1) cleanliness.

Do I hear anyone laughing or starting to chuckle? I said you MIGHT be able to achieve a Wj-1 (white metal) cleanliness with a power washer. Low pressure water cleaning (LP WC), under 5,000 psi (350 bar) can do a lot. IF you have a coating that is just barely hanging onto he surface, a power washer MIGHT just do the job, and is much more economical than a UHP WJ unit. The City of Winnipeg goes around routinely with low-pressure water cleaning to get the salts off of bridges before staring repair jobs. They are using lots of volume and low pressures. Because that procedure is used routinely to remove LOOSELY adherent materials, after a while there are no more failures. However, most likely you will use Ultra-high pressure waterjetting to achieve a WJ-1 surface.

Now I have shared the basics of the three aspects of surface preparation

Visual Cleanliness

Anchor Pattern

Invisible Salts

I have covered the three viewpoints necessary for a good job.

Owner, operator

Contractor

Coatings manufacturer

Just a reminder that water alone is used primarily in maintenance and repair, not new construction.
Where does water really shine?

Water does a solid job on: heavy rust, removal of heavy, elastomeric coatings, thick urethanes and epoxy, rubber, barnacles, fiberglass filled paints, salts, lead based paint, and ice breaker coatings.

Water cleans from the bottom up. When you clean from the top down, the particles just bounce off rubber or elastomers. Production rates on elastomeric coatings are two to six times faster than abrasive blasting.

PLEASE, don't create additional OBJECTIONS. It is much more inspiring to show removal of a THICK coating or heave SCALE during a demonstration. Leave the audience with a POSITIVE view. It always amazes me when I am at a water blasting demonstration and the

contractor pulls out a plate with a thin, conventional coating, and he starts blasting away with water. Conventional coatings are removed more quickly with abrasive alone. People at the demonstration won't stop to think about all the other factors involved in th3 job. At that point, the audience is only seeing and thinking about cleaning rates in square feet per hour. The Contractor has created his own OBSTACLE. Please don't shoot yourself in the foot.

SUMMARY

When conventional OBJECTIONS are reduced to mere OBSTACLES, water in surface preparation truly seems to be a winning situation. By creation of a standard language, we have established the ground for improvement initiatives. "Do the Basics Well."

We get

Environmental advantages,

Safety,

Performance enhancement,

Good surface preparation,

And economic advantages.

Remember **SAVE OUR STEEL** "**SOS- SALTS ON SURFACES."**

We are **"Rebuilding the maintenance industry with WATER. MOUNTAINS OF WASTE ARE REDUCED TO HANDFULS."**

"WATER IS THE TRUE GRIT OF THE FUTURE."