

## Time is Valuable

*Written by Steve Rudy, Technical Sales Representative*

Of all the measured parameters we deal with, time is perhaps the one that receives the most attention. Have you considered how fragile the success of organized and professional sports would be, without fixed times, to keep the action balanced? How exciting is a football game if the time to snap the ball is unlimited? Would the absence of a shot clock keep basketball exciting? How would unlimited time in soccer affect the penalty kicks, in deciding the game's outcome? Activities revolve around time, acknowledging it to be a critical parameter to planning, execution, and review. We begin our day, conduct our work and social activities, eat, and sleep, all adhering to some degree of timeliness. If one is not careful, the anticipated schedule can easily be derailed. That is why compensation must always be an integral part of time. In the '90's, *time management* was a popular phrase, intended to keep us on track. Date planners, electronic messaging, and post it notes, are some of the devices intended to help and remind us. Are these helpful? Certainly, if used properly and within the scope of application. If we do not consider the validity of time, then all efforts will quickly become wasteful.

In the metal finishing industry, the value of time is highlighted in many ways. No matter how inconsequential it may seem, it is surprising just how critical it is. Finishers and suppliers share in the responsibility to focus on the importance of time. It is so important, that the quality of finished coatings and treatments depend heavily on it. Typical processes we deal with include chemical immersion and induced reactions. These revolve around basic scientific principles. No matter how innovative, updated, or new systems are developed, time can be at the centerpiece of success. In another industry aspect, outside considerations from government and regulatory agencies incorporate time as an important factor. Let us consider some of these items, and how they interact with time as a valuable parameter.

### *Mass Finishing*

The process incorporates the action of mechanical energy and chemical reaction to modify the surface of parts, obtaining the desired characteristics. The objective may be cut down, deburring, or burnishing. Any such cycle is dependent on chemical concentration, ratio of media to parts, operating conditions of the equipment (e.g. barrel or vibratory), temperature of solution, and time of the cycle. Solution temperatures do not vary much. It is generally room temperature, rarely warm. Chemistry is normally based on proprietary blends that will accomplish the treatment specified. Time is the allocated driving force to accomplish the end result. Modifying the other listed parameters will normally affect how long or short a period it takes to complete the cycle. This has a bearing on desired production throughput.

### *Surface Preparation*

Cleaning and activation can be included, since there are distinct similarities. In both steps, unwanted surface materials are removed, thereby preparing the base metal for subsequent treatment. Soak cleaning is predominantly an immersion step. Parts are conditioned in an

alkaline solution that usually includes surfactants, builders, inhibitors, and alkaline salts. Oily soils and grease are removed in this step. The concentration of this cleaning formulation is based on product development to accomplish the desired effect, in a particular time sequence. It normally meets the range of dwells programmed into automatic process lines. Concentration and temperature will modify the time according to an acceptable target. An old finisher's measure is very effective: for every 20 degree rise in temperature of the cleaning bath, the required time for cleaning is halved".

Electro cleaning adds mechanical scrubbing action to further enhance the effect of surface preparation. The applied current density generates a magnitude of gas bubbles (focus is primarily oxygen per anodic condition of the parts), to remove or loosen unwanted surface materials such as scale, oxides, and rust. Voltage requirement is affected by the solution temperature and concentration of the electro cleaning formulation. Desired time is contingent upon concentration and temperature. This electro cleaning surface treatment is usually allocated less than half the time of the previous soak-cleaning step. Time becomes a valuable parameter in cleaning.

Acid activation promotes the surface conditioning to neutralize alkaline films, dissolve oxides, scale, & rust, and activate the surface prior to subsequent finishing. The quality time required is based on the acidic solution concentration and it's operating temperature. An optimum balance between these two parameters affects the required time for this final surface preparation step. In many instances it may be equal to in duration to the previous electro cleaning step or even half of it.

### *Electroplating*

Every process bath used to deposit a metal or alloy conforms to Faraday's Law: the quantity of electricity that is transferred per equivalent weight of an element or its ion. The quantitative value is approximately 96,500 coulombs. The desired or required deposit thickness is related to the applied current density and time of application. As the current density increases, the plating time for thickness requirement decreases. There is a balance to the relationship, by which related conditions and parameters are critical. Bath chemistry, permissible temperature and current density ranges, concentrations of chemical additives, and purity of the plating solution, are important to each system. Optimizing these conditions will allow the process to meet the plating requirements in the optimum time relative to it.

### *Post & Specialty Treatments*

There are several types that can be mentioned. They include: chromates, phosphates, black oxides, and rust inhibitors. Optimized temperature and concentration of each specific treatment permits the use of the right time, for the best results. Quality time is valuable. If only occurs if the process is on target.

Our industry also acknowledges time as a valuable parameter in relation to mandates and changes. Regulatory agencies require adherence to specific limitations with regard to effluent discharges and handling of sludges. Any modifications to specific concentrations or materials allow a time period in order to maintain compliance. Manufacturing changes, such as the



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implementation of RoHS, grant a period of time for finishers and suppliers to conform to new requirements.

Time is a valuable part in any facet of the metal finishing industry. On time: manufacturing, finishing, packaging, and delivery, can only occur if every step in any process is optimized. In so doing, time is a most quality part of the system. There can be lots of time, if used wisely.

The clock is ticking. Are you on time?