Tower Oil & Technology Co.

WHY DO PARTS RUST?

Rust is a lot like death and taxes. It is always lurking in the background. It must be factored in as part of the manufacturing processes, with standard operational procedures set-up for its prevention. Many variables in the manufacturing processes can become contributing factors capable of causing rusting or staining of piece parts and components. Four common ones can be identified as:

1) Environmental Conditions
2) Nesting of Parts Processed with Water Extendable Lubricants
3) Interaction of Active Lubricants on Sensitive Surfaces
4) Inter-Plant and Long Distance Shipping of Parts

ENVIRONMENTAL CONDITIONS

There are various ways that both raw metal stock and finished piece parts can rust due to environmental conditions. The most obvious involve in-house finishing operations such as plating lines and pickling tanks that often result in release of chemicals into air, which subsequently can cause rust. Salts from heat treating operations can also contribute to rust. Storing materials and parts in a high humidity environment without rust protection is another factor. This problem can be due to certain weather conditions, particularly when plant doors and windows are open, allowing contaminated air (pickling and plating fumes) into the plant. Another situation that deserves attention is "wash off" conditions that exist on edges of coil stock and on the surface of finished parts stored in open containers - especially the top layer. Along these lines, snap condensation can occur when the plant heat is turned off or lowered on holidays and weekends. The change in temperature condenses moisture on

material surfaces. Moist air used for blow off can also become a possible source of rust. Yet another condition warranting investigation is possible bacterial contamination in the coolant tanks used in processing metal parts.

NESTING OF PARTS PROCESSED WITH WATER EXTENDABLE LUBRICANTS

When using water extendable coolants and lubricants care must be taken not to trap or nest these lubricants between mating surfaces. This is an ideal condition for promoting rust because localized corrosion cells will be formed. There are several ways to reduce or eliminate this condition. Initially, drain or blow off excess lubricant from the part before it goes into the storage bin. Since the bottom layer of the parts container collects the run off of any excess water extendable coolant, it can be entrapped in such a way as to create a humidity chamber in which a considerable amount of rust can be produced. One of the best ways to eliminate the interaction of water bearing lubricants nested between metal surfaces is to use water displacing rust preventives. They are available as dry films, oily films, or water extendable types which can be applied by spraying or dip tanks.

INTERACTION OF ACTIVE LUBRICANTS ON SENSITIVE SURFACES

Chemical properties of lubricants, when interacting with active metal surfaces can be the cause of rust and surface corrosion. A partial list of such sensitive materials would include galvanized and tin coated metals, aluminum, and yellow metals.
Some of the most sensitive metals are of the galvanized coated type, which includes hot dip, electrogalvanized, galvanneal and galvalum. Since the sensitivity of these coatings to lubricants can vary greatly, it would be advisable to test candidate coolants

for compatibility with the particular galvanized surface. The lubricant of choice should always be used within all control parameters recommended by the lubricant supplier. Galvanic coatings can react with moisture to cause electrolytic reactions, which result in "white rust" formation. Minimization or elimination of this problem can be accomplished in various ways:

1. The thickness of galvanized coatings must be sufficient to withstand the forming pressures of the operation. Recommended starting thickness should be at least 3 to 5 mils (0.003" to 0.005"). Any fracture of the coatings will expose the base metal, resulting in rust development in the presence of any moisture.
2. Lubricants chosen to work galvanized coated metals must be compatible with the surface of metal stock. Lubricants cannot be over-active to the point of causing white rust formation.
3. Finished parts that have been fabricated with water extendable lubricants need to be properly drained, dried and stacked.
4. Additional protection for galvanized surfaces can be provided when needed with the addition of chemical passivator at the mill. Such coatings are very thin and usually invisible, the most common type having water-based chromate chemistry. These clear passivation coatings have been in use for many years, and their performance is very exceptional with respect to minimizing the tendency for staining when the sheets get wet while in coil form or bundles. Steel sheet manufacturers use the term "passivation treatment" or "chemical treatment" to define such surface treatment, both terms often used interchangeably. This extra protection can be very helpful on parts that have been fabricated with water extendable lubricants that have not been drained sufficiently.

Other sensitive metals, which cannot tolerate contact with some lubricants, are aluminum and copper alloys. These metal surfaces can react with chemically aggressive ingredients, resulting in staining, oxidation and corrosion. Specialized lubricants which have been chemically "pacified" to prevent interactions with aluminum and yellow metals, are readily available. Such metal-specific products can provide the compatibility necessary to insure piece part integrity and surface finish.

INTER-PLANT AND LONG DISTANCE SHIPPING OF PARTS

Some of the considerations involved in selecting a rust preventive are the environmental conditions existing during transport and length of trip. The compatibility of the preventive with the manufacturing process and the method of removal must be considered. The use of plastic bags and cardboard (corrugated) boxes can result in rust formation under certain conditions. Parts being placed into plastic bags must be completely dry before placement in what can become a humidity chamber. Nesting of parts in cardboard boxes will create a rust producing environment. Care must be taken to insure that such parts are kept separated at all times. Sometimes the finishing process determines which family of preventives should be used - dry film, oily film, waxy film. Make sure that the type of rust preventive chosen can provide the required rust protection.

SUMMARY

This information is being provided to serve as a means of focusing on the causes of rust and how to prevent this costly problem. The best way to approach rust is to realize that, under certain conditions; it will occur and continue unless proper precautions have been taken. 02200/114