

Care and Seasoning of Metal Forms and Rings

Release agents can contribute to the quality of your product as well as the longevity of your forms.

BY BOB WATERLOO

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Would you ever have thought that you could make money just by walking around? That's the first step (no pun intended) of a maintenance program for your metal forms and rings. Just by taking a look at these expensive pieces of equipment, you can tell whether or not they are getting the attention they need. If they are suffering from neglect, they can cost you later in terms of reduced longevity and deteriorated product quality. It helps to be armed with a little knowledge about form release agents, rust inhibitors and rust preventatives and how they react with metal.

Forms and rings are part of our lives, and we need to maintain them in order for them to perform and provide us with profits and saleable castings. With just a little effort, we can prepare these forms for optimum production, minimize labor required to keep them clean and functional, and just make our lives a lot easier.

First, here are some of the basic items needed for form and ring storage and maintenance:

- Level area
- Concrete platform or timber material on which to store them
- Covers or tarps for moisture and dust protection (indoor covered storage is ideal but often unavailable)
- Power washer
- Putty knife or long-handled ice scrape
- Brass wool, scrub pads or other minimally abrasive material for cleaning
- Electric grinder with wire brush head (not recommended unless absolutely necessary)
- Release agent (petroleum solvent-based) for long-term form protection

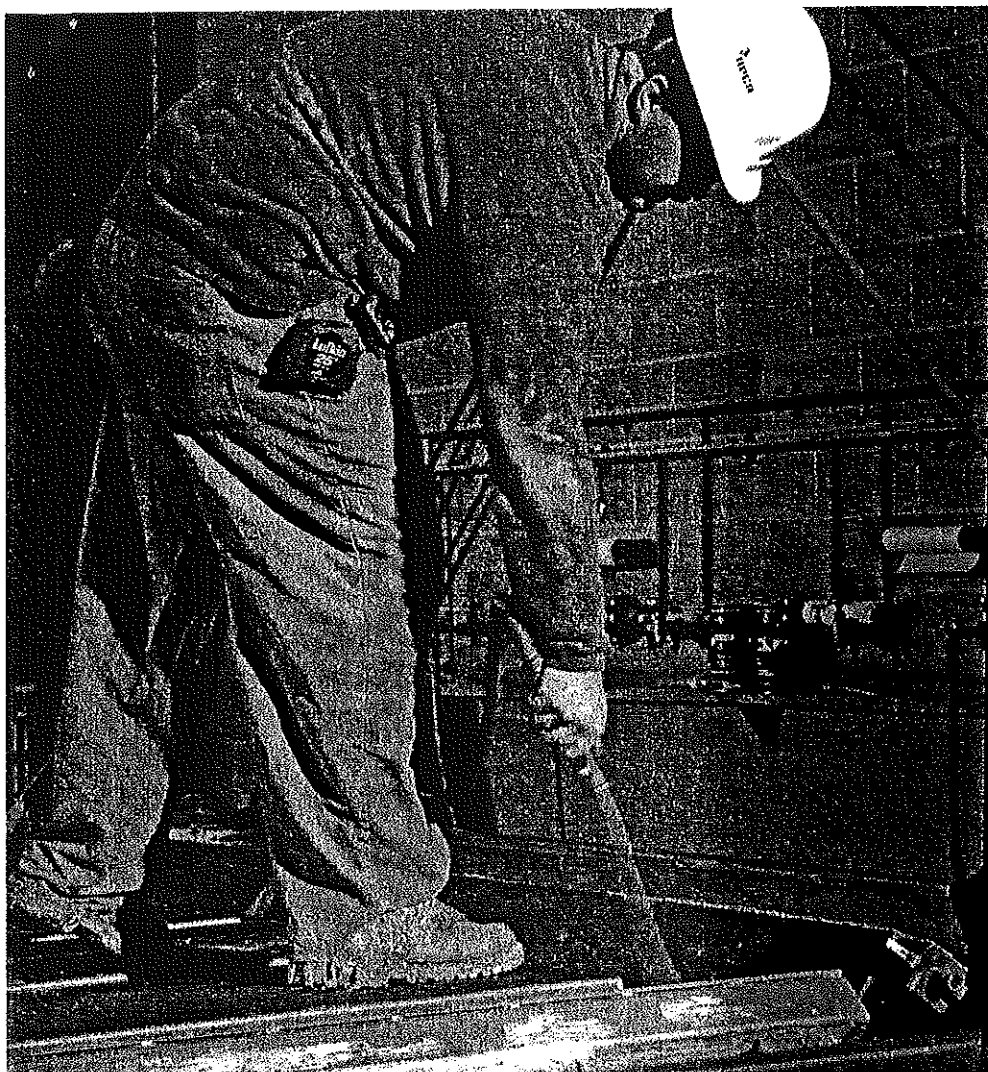
In an ideal world, all of this expensive equipment would be stored indoors in a protected, heated and dry area. Unfortunately this is not the case in the real world, so we need to take care to give our equipment the best possible care with what we have available.

Short-term and long-term storage

For short-term storage, a good quality VOC compliant petroleum solvent-based form release will normally serve our needs. Before the form is put into storage, apply a liberal coating of the form release. If the forms are stored outside, even for a short period of time, a quick walk-by is often necessary to be sure the form release has not washed off from the rain. If any evidence of rust is present, apply another coat of the form release on the forms and rings as quickly as possible.

For long-term storage, a good quality VOC compliant form release will do the job, but as outlined above, recoat with the form release on a regular basis. A biodegradable form release (meeting the EPA definition of biodegradability, but not a water-based material) is preferred, as over-application is desired and some of the material will end up on the ground.

The second alternative for long-term storage is a rust inhibitor. Rust inhibitors should have the capacity to displace the mechanically held water on the surface of the form. The form also needs to be protected with a plastic cover or inverted so that rain and snow do not wear the rust inhibitor away. With rust inhibitors, the form can generally be brought back into production with a minimum of labor required to remove the inhibitor. If you are using a water-based form release, it is best to apply a rust inhibitor or rust preventative



NCO photos



as quickly as possible, as the residual water will cause rusting immediately.

The third alternative is a rust preventative. These are typically epoxy-based materials that can be compared to a layer of paint. While rust preventatives generally do a good job in protecting the forms, they are fairly labor intensive in application and should be removed before bringing the forms and rings back into production. Grinding is usually necessary to remove the rust preventative, which in turn destroys the "seasoning" of the form.

When storing equipment, it should be stored in such a fashion that it can be put back into production without having to spend time adjusting or repairing. Rings (pallets and headers) should be stored in flat racks in a stack and, if possible, on pallets.

Seasoning

Reactive form release agents, the most commonly used release agents in

precast and pipe production, typically contain fatty acids. Fatty acids are mild acids composed of animal fats and vegetable oils. Of course there are a very great number of possible combinations of animal fats and vegetable oils, and not all combinations will serve as "good" reactive form release agents.

The reactive portion of the form release agent serves two initially important functions. First, fatty acids have a natural affinity for metal. This includes gray, ductile and malleable iron, brass, bronze, aluminum and mild steel. Fatty acids react with metal to form a protective barrier, which is a coating of metallic oleate. This process is known as seasoning. This protective layer prevents further application of fatty acids from migrating to the metal of the form and allows the fatty acid to remain on the surface of the form to react with the free lime on the surface of the casting.

Try using this analogy on your production workers to help them understand some of the concepts of seasoning:

A fisherman always has his "favorite" frying pan. There is no way that he would ever let that frying pan be put in water and scrubbed clean with a scouring pad. Why? Because it would remove the seasoning that is part of the pan. If he has to buy a new pan, what is the first thing he does? He gets some lard or vegetable oil (both are simple examples of fatty acids), puts it in the pan and places the pan in the oven at a high temperature for an extended period of time. Why? So the pan can become seasoned.

This same seasoning holds true for your forms and pallets. When concrete is poured into the form, the reactive portion of the form release (the fatty acid) reacts with the free lime on the surface of the concrete to form a metallic soap. This reaction is called neutralization. As fatty acids (typically a pH of 6.8) react with the free lime on the surface of the concrete (typically a pH of 11.5), they neutralize one another and create the metallic soap, a reaction known as saponification.

This soap, then, also serves two purposes. First, it



enhances the easy separation of the form from the castings. Second, as it is a soap, it allows free air to rise more easily on the vertical surfaces of the castings, resulting in fewer surface defects.

Once this metallic oleate layer is created on the metal form, any grinding or surface abrasiveness, including welding to repair a form or grinding with wire brushes, will destroy the protective layer. The next time a reactive form release is applied, the fatty acid will react with the form, leaving nothing to react with the free lime. It is very important to minimize grinding on forms, and usually nothing finer than a putty knife or an ice scraper should be used to remove splatter or

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Detail B

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"stickers." In the case of sticker, there is a reason that this occurs, and normally an application of a seasoning agent to this small area will help prevent future sticking and buildup.

Seasoning of forms is a very basic requirement to help minimize the amount of labor involved when forms are stripped or pipes are tipped out. If forms, pallets and headers are properly maintained, labor cost and better looking castings are the end result.

Forms in storage, new forms, pallets and headers

New forms, pallets and headers will frequently arrive with a protective coating on them to help prevent rusting in transit or until the forms are sold and delivered. This protective coating can be allowed to wear off, but at that point it is allowing raw metal to be exposed. While the first few pours might be satisfactory, now that raw metal is exposed, the reactive portion of the form release agent will now start to react with the raw metal, leaving nothing to react with the free lime and form the metallic soap. An alternative is to remove the protective coating with solvents or grinding and apply a seasoning agent, allowing it to set for a minimum of four hours. A 24-hour period is better, as it allows more

seasoning to take place. Also, forms that are exposed to the sun will season more quickly as higher temperatures increase the reactivity with the metal forms and rings.

Forms that have been in storage and have rusted also need to be reseasoned. Rust is nothing more than oxidized metal, and when rusting occurs, the metallic oleate barrier has been destroyed. Casting can be done without removing the rust, but again, once the raw metal is exposed, the fatty acid will react with the raw metal until the form is seasoned. The rust stain will also transfer to the casting. An alternative is to grind down the form/pallet/headers, apply a seasoning agent and allow time for the reaction to take place to allow the metallic oleate to form.

The old saying of "An ounce of prevention is worth a pound of cure" holds true to maintaining your forms, pallets and headers by getting them seasoned and keeping them seasoned. A little attention today will save a lot of grief tomorrow.

Proper treatment of this very costly equipment with the care it deserves will enable you to be more competitive in the marketplace and be a better steward of our environment.

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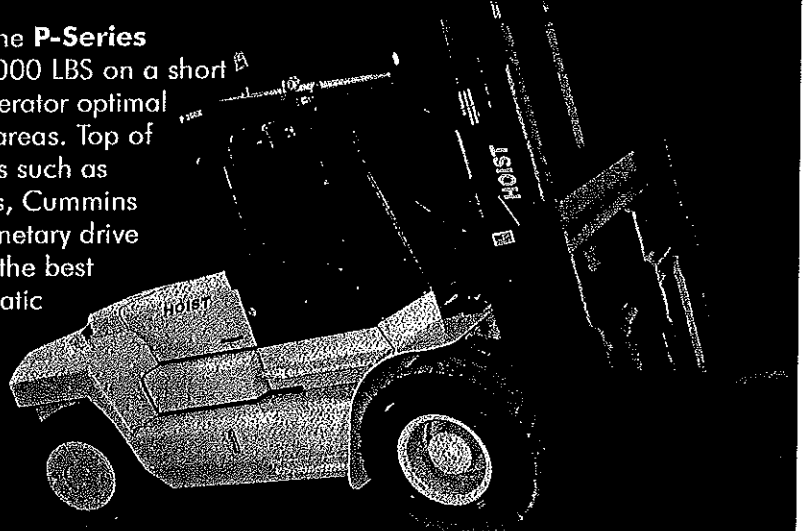
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