

*Battling bugs  
TLC for your starch kitchen  
Harlo-Cide*

IN THIS ISSUE

Harper/Love Adhesives Corporation  
11101 Westlake Drive  
P.O. Box 410408  
Charlotte, North Carolina 28241-0408  
Leaders in the science of  
making good adhesives better™  
800-438-3066  
www.harperlove.com  
e-mail: sales@harperlove.com

Your corrugating adhesives newsletter  
from Harper/Love Adhesives Corporation

REPORT

ADVANCED  
ADHESIVES



# HARLO-CIDE™

## STARCH ADHESIVE PRESERVATIVE AND STABILIZER

**H**arlo-Cide is a broad-spectrum preservative which will control the growth of a wide range of microorganisms including bacteria, mold, and yeast.

The active ingredient is registered for use as a preservative of industrially prepared water-based suspensions. It is most effective when the pH is alkaline, as in corrugating adhesives.

Harlo-Cide is FDA approved for adhesives intended for food packaging and meets all federal and state guidelines, including Proposition 65, and CONEG Legislation.

- *Effective microbial control*
- *Excellent preservative for starch adhesive*
- *Broad-spectrum activity*
- *Maximum effect in alkaline environments*
- *Easy to use*



*Harlo-Cide is packaged in handy 1-lb water-soluble bags, and in 200 lb fiber drums.*

*Recommended dosage: 1 to 2.5 lbs in the final adhesive.*



# ADVANCED ADHESIVES REPORT

Your corrugating adhesives newsletter  
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MAY 2003

## Battling bugs

**Bacteria, yeast, and mold can wreak havoc with your adhesive and create a host of problems**

By Rex Woodville-Price  
and Cassie Rothstrom, Walla Walla Environmental, Inc.

Is your starch adhesive batch experiencing unexplained loss of viscosity? Have you noticed a chalky residue at the bottom of your storage tanks? Does your storage tank smell like rotten eggs? Are you experiencing unexplained bonding problems at the corrugator?

### **You may have a bacteria problem**

It is hard to believe that any organism could survive the very caustic environment (pH 12) of corrugating adhesive, but there are some that not only survive, they actually thrive. These organisms, which we often call "bugs," are actually bacteria, mold or yeast. They will primarily eat the gelled (carrier) portion of the adhesive; the ungelled, raw starch is too hard for them.

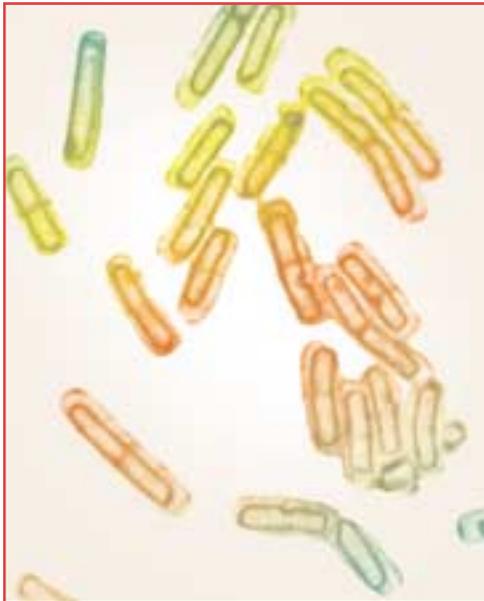
The carrier is what gives the finished batch of adhesive its viscosity. Since carrier is typically only 3% to 8% of the adhesive, the bugs don't have to eat very much before it affects the viscosity. As viscosity drops, so does the adhesives' ability to keep the uncooked starch in suspension.

Raw starch is too large to penetrate paper fibers. Only the cooked carrier (or the additives) can penetrate the paper fibers, so it is therefore responsible for the initial bond, particularly at the single facer. As the amount of cooked carrier is reduced, the bonding ability of the adhesive is diminished.

### **Signs that something is bugging you**

- A chalky residue in bottom of tanks or trays. This is caused by the raw pearl starch falling out of suspension as the bugs eat the cooked starch and lower viscosity below the point at which that amount of starch can be suspended.

- Sudden drops in viscosity that cannot be explained by other means.
- A bad odor is usually a sign of contamination but you can have problems without the odor. (Usually by the time you smell it you already have a serious problem.)



*Chemically, the cooked carrier is very similar to dextrin, which is a type of sugar. So it's fair to say that corrugating adhesive is like candy to bacteria, mold, and yeast. Yum.*

### **How to prevent or control contamination**

- Use fresh adhesive, don't store adhesive for long periods of time.
- Don't use air for agitation of your storage tanks. Some bacteria feed on air. Try blade agitation instead.
- Use a long-term preservative in every batch of starch adhesive to prevent bacterial growth in the storage tanks and lines.
- If you find you have a bacteria problem, you may be able to use a quick-kill biocide to salvage the batch.
- Clean tanks and lines quarterly with an approved cleaner. Be sure to stay away from phosphate-based cleaners. Phosphates are a natural food source for bacteria and if a phosphate-based cleaner is not completely rinsed clean from the lines, it can actually make the bacteria problem worse.
- Have your starch adhesive tested regularly (quarterly) for bacteria, mold, and yeast. In a laboratory, cultures are made in an agar medium and a count of the resulting colonies is an indication of the severity of the infestation.



# Tender loving care for your starch kitchen

*A conscientious preventive maintenance program will keep you running smoothly*

by John Kohl

Since the development of the Stein Hall method for producing corrugating adhesive, there have been many changes and improvements in starch mixing equipment. Over the last 60 years mixers have gone from the standard two-tank mixer to a completely automatic, high shear system. Regardless of the type or age of the mixing equipment used in your starch kitchen, they all need daily care and maintenance. With this in mind, all box plants should initiate a preventive maintenance program for the starch kitchen and associated equipment. A good PM program will ensure that the mixer can consistently produce starch adhesive that has the desired properties.

The age, condition, and complexity of your starch mixer will determine the type and amount of care needed to keep it in top running form. For newer, high shear models, the manufacturers supply the plant with a comprehensive Preventive Maintenance schedule. For older mixers, the information may be hard to locate, or totally nonexistent. All types, makes and models of mixers share some basic care requirements.

Maintenance and service items can be broken down into groups based on the frequency that they need to be performed. Since they consist primarily of visual checks, they can be handled by the starch maker or key operator who monitors the automatic systems.



*Starch strainer full of debris*

## Daily Maintenance

- Rinse the inside and outside of the mix tanks with water. This is to remove starch residue from the mixers and give a clear view of mixer blades and bearings. Then check the

blades, props, bearings, steam line, temperature probe, and other equipment associated with the mixers. This also helps to reduce starch debris accumulation that will add to the mixer weight and reduces debris falling off the walls of the mixer during subsequent batches, which will affect finished batch viscosity. Take care not to run water on electrical control panels.

- Clean starch debris from storage tank strainer baskets. This will ensure continuous flow with good straining.
- Clean starch debris from all corrugator open starch sumps.
- On horizontal mixers, inspect the shaft seals and packing for wear and leaks.
- Inspect starch supply and return pipes for leaks.



*Leaky gear packing*



*Center bearing missing*

## Weekly maintenance

- Check the drive belts on horizontal mixer shaft for wear and proper tension.
- Drain moisture from air filters and check oil level in air lubricators. Newer automatic starch kitchens rely on clean, consistent compressed air to function properly. Any pressure variations can cause adhesive batch variations.
- Check air lines for leaks and repair as necessary.
- Inspect mix tanks, storage tanks, pumps, water lines, steam lines, and starch pipes for leaks.
- Inspect the starch supply, return, and transfer pumps, for leaks in seals and packing.
- Lubricate supply, return, and transfer pumps.
- Inspect and grease mixer shaft bearings.
- In automatic starch kitchens, inspect borax additive hopper discharge valve and auger tip, for product buildup and clean out as necessary.
- Inspect wet strength resin and liquid additive supply pumps and lines for leaks and proper function.

- Flush entire starch supply and return pipe system with water to remove any old starch buildup.

### Monthly maintenance

- Check grease and oil levels in mixer gear boxes.
- Grease bearings on mechanical conveyor parts.
- Inspect filter bags for leakage, wear, and proper air flow.
- Check all manual and automatic valves for leaks and proper operation.
- Clean the air filter on the control cabinet air conditioner.
- If the incoming steam line has a “Y” strainer, clean it out.
- For systems that have pneumatic cylinder actuators, check them for air leaks and proper operation.
- Check rotary air locks on the silo and weigh hoppers for leaks in packing seals and oil level in the gear boxes.
- Check belt tension, belt condition, and oil levels on fluidizer and transfer blowers used for silo starch.
- Check the TVC system, regardless of type, for proper function of pumps, heaters, and temperature sensors.

### Quarterly maintenance

- Grease all mixer motors according to the motor manufacturer’s specifications.
- Clean the entire starch system—mix tanks, storage tanks, supply lines, and pans—with an approved cleaning chemical. Sanitize with bleach and flush with water to remove any residual starch buildup and prevent the spread of bacteria throughout the system.
- Lubricate the bearings on TVC hot water circulation pumps.
- Drain and flush TVC tank and pipe system. Scale inhibitor can be added to the water tank to keep scale and rust from plugging pumps and lines.
- Check and calibrate manual scales used to weigh chemicals.
- Test and calibrate load cells on mix tank and chemical weigh tanks, and associated displays per OEM specifications. This will ensure consistent and accurate addition rates of batch ingredients.
- Calibrate temperature controls for mixer and storage tanks.
- Inspect mixer blades for damage, balance, and secure attachment to the mixer shaft.
- Check and calibrate meters on systems with independent liquid caustic soda meters.
- Check and calibrate meters on systems with independent water meters.
- Check and calibrate on systems with independent water meters used for flexo water addition.

- Inspect liquid caustic soda pumps, lines and valves, for leaks and proper function.

### Semiannual maintenance

- Change oil in gear boxes of silo fluidizer and transfer blowers.
- Grease motors for silo blowers.
- Inspect dust socks in silo bag house bin vents, for wear and damage. Replace if necessary.
- Grease motors on mechanical transfer auger for silo starch.
- Replace air filters on the silo conveyor and fluidizer blowers.
- Inspect all silo starch conveyor lines for leaks.
- Check operation and calibration of any level control devices.
- Inspect chains for wear on older systems that use chain drives for augers and rotary air locks.



*Conveyor motor and belt need cover*

Poor maintenance of mixing equipment can cause variations in viscosity, temperature, and gel point of starch adhesive. If there is a recurring problem in the finished adhesive, verify that it is not equipment related before making changes in your formula. Monitor finished adhesive batch data for trends. In the case of newer, automatic mixers, the system records an alarm message for any out-of-range parameter. This alarm system data can be used to help identify a problem, whether it is related to equipment or raw materials. The problem may be as simple as a faulty load cell or worn out water meter. Bacteria in the adhesive storage tanks would also need to be ruled out. Performing routine maintenance and cleaning of your starch kitchen ensures that your corrugator is always supplied with consistent, high quality adhesive.

