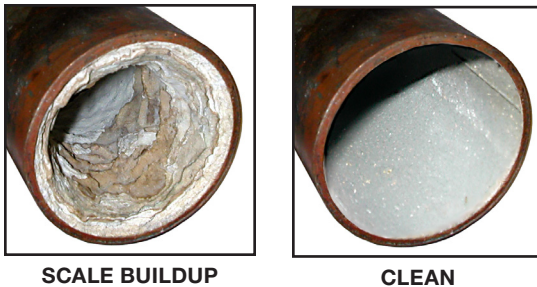


Descalers

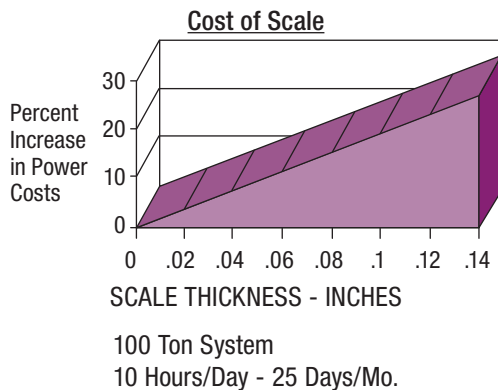


FIGURE A



SCALE BUILDUP

CLEAN



Removing Scale from Cooling Tower Systems

Excessive head pressure can cause a compressor to work harder and draw extra current, which leads to increasing power costs lowering the unit's capacity or even resulting in a motor burnout.

High head pressure can be caused by mechanical factors such as air in the pump, overly small water lines, plugged louvers or sprays, an overloaded tower, fan malfunction, or moisture in the air return. Excessive head pressure can also be the result of a buildup of scale in the pipes (as seen in Figure A) and water regulating valves, which restricts water flow and prevents heat from dissipating. Scale is typically the culprit if the head pressure is more than 10 psig above normal, or if the liquid refrigerant line is very warm. And once it has formed, the scale must be removed by dissolving it with a scale remover.

Testing the Scale

To determine if a scale remover will dissolve the scale, put a sample of scale into a half glass of water with 2 or 3 teaspoons full of acid and stir. If the scale bubbles, breaks up, or dissolves, the remover will work. If it doesn't, send a sample of the scale to Nu-Calgon for analysis and advice on how to remove it.

Selecting a Scale Remover

Scale remover is available as a powder or a liquid. Powdered acids, such as Nu-Calgon's **Season Start**, provide the utmost safety and handling to the user. The product is nonvolatile and gives off no obnoxious or corrosive fumes, and it can be easily swept up if spilled as if it were salt. Season Start is safer for equipment, and is properly inhibited to provide protection to steel, copper, brass, aluminum, stainless steel and galvanized surfaces. Also, Season Start will not remove old corrosion products as fast as liquid acids, so there is less danger of springing leaks in old corroded systems. Adding too much powdered acid will not cause excessive corrosion rates while adding too much liquid acid can increase the corrosion rate.

Nu-Calgon's **Liquid Scale Dissolver** works faster and can be more economical than powdered acids. However, do not use liquid scale dissolvers on systems that contain galvanized, stainless steel or aluminum. The hydrochloric acid in these products could damage those and other soft metals. If one does not know what types of metals are in the system use Season Start. Both products include a built-in pH color indicator, which shows how much to use, when to add more, and when the system is clean. pH test paper is also provided.

Eco-Lyme is a new liquid descaler for the HVAC/R market that provides a unique blend of performance with a desired eco-profile. The product is specially formulated to achieve descaling behavior of competing hydrochloric acid based descalers. However, the active ingredient is substantially safer on equipment – especially suitable for stainless steel and aluminum materials in the equipment. Eco-Lyme is odorless and low foaming chemistry for added safety. Eco-Lyme is biodegradable.



Liquid Scale Dissolver

- Liquid hydrochloric acid
- Strong and fast... dissolves iron oxide as well as scale
- Contains low-foaming corrosion inhibitors
- Built-in pH color indicator

Packaging:

1 Gallon Bottle: 4330-08
 2.5 Gallon Pail: 4330-03
 5 Gallon Pail: 4330-05
 55 Gallon Drum: 4330-01

Eco-Lyme

- Liquid organic acid
- Powerful and fast...behaves similarly to traditional hydrochloric acid
- Safer on system metals... ideal for stainless steel and aluminum alloys
- Odorless and low foaming chemistry
- Readily biodegradable

Packaging:

1 Gallon Bottle: 4167-08
 5 Gallon Pail: 4167-05
 55 Gallon Drum: 4167-01



Season Start

- Powdered Sulfamic acid
- Contains best inhibitors available for all metals, including galvanizing
- Non-volatile... gives off no obnoxious fumes
- Built-in pH indicator

Packaging:

10 Pound Container: 4360-88
 50 Pound Pail: 4360-84

Liquid Scale Dissolver and Season Start feature Nu-Calgon's exclusive pH color indicator, a feature that lets you see when the job is done. In addition, the liquid product features safe, low-foaming characteristics.

pH Color Indicator

Nu-Calgon's exclusive "built-in" pH color indicator in Season Start and Liquid Scale Dissolver advises you when to add more acid and it lets you see when the system is clean. At working strength, the acid cleaning solution is green or light blue. When the acid solution is neutralized and is no longer working, it turns purple and more acid must be added. The system is clean when the green color is retained for 20-45 minutes.



Neutralized



Working Strength

Low-Foaming Performance

To demonstrate its capability as a low-foam product, Liquid Scale Dissolver was added to a beaker containing lime scale. A leading competitive hydrochloric acid based product was added to another beaker containing an equal amount of lime scale. The difference is dramatic. When cleaning towers and evap condensers, low-foam is the preferred approach as high foam is both dangerous to personnel and surroundings and it represents wasted acid.



Competitive Product
with Dangerous Foam

Nu-Calgon
Low-Foaming Product

Cleaning Instructions

- First clean the spray nozzles or water distribution holes.
- Shut off bleed and make-up water
- Drain sump. Scrape or hose down loose scale and sludge. Flush out all loose sediment from sump.

Liquid Scale Dissolver: Safely descales copper, steel, iron, brass, wood, rubber and plastic equipment.

- Fill system with fresh water adding one gallon of Liquid Scale Dissolver for every 20 gallons of system water. For dilution guidelines per system tonnage, please refer to the dilution table on the next page. Allow acid to recirculate until all scale is removed. At first the strong descaler will be green. A blue or purple solution indicates that all of the acid has been neutralized by reacting with the lime scale and another dose of Liquid Scale Dissolver is needed. After every third addition of acid, flush the system and add fresh water before dosing again.
- The system is free of scale when the solution retains a green color for 15-30 minutes. If it is not possible to observe the solution color, use the pH test strips, included with the package to determine whether the solution has been neutralized. Do not leave Liquid Scale Dissolver in the system longer than necessary to remove scale build-up and never longer than six hours.

Warning: Liquid Scale Dissolver may damage stainless steel and aluminum or remove the zinc from galvanized metal. For stainless steel or aluminum materials, use Eco-Lyme. For galvanized surfaces, use Season Treat.

Eco-Lyme: Safely descales copper, steel, iron, brass, wood, rubber, stainless steel, aluminum and plastic equipment.

- Fill system with fresh water. For typical medium to heavy duty cooling tower descaling, the recommended dilution is one gallon of Eco-Lyme per two gallons of system water. (For light duty descaling, Eco-Lyme can be diluted up to one gallon per 4 gallons of water, but the rate will be slower.) For dilution guidelines per system tonnage, refer to the dilution table below. Allow acid to recirculate during descaling process. Periodically, check the solution with the pH strips that accompany the product. If the paper is red, the solution is at a working strength. If the paper is orange/yellow, the Eco-Lyme has been neutralized and more product is required. Flush the system and add fresh water before dosing again.
- Eco-Lyme will descale most systems within four hours, often within the first two hours depending on scale severity. Never leave Eco-Lyme in system beyond six hours.

Warning: For galvanized surfaces, consider Season Treat.

Season Start: Safely descales common metals of construction, galvanized surfaces and plastic equipment

- Fill system with fresh water adding 10 lbs. of Season Start for each 50 gallons of system water. For dilution guidelines per system tonnage, please refer to the dilution table below. Allow acid to recirculate until all scale is removed. At first the strong descaler will be 'green' or 'light blue' at its working strength. A 'deep blue' or 'purple' colored solution indicates that all of the acid has been neutralized by reacting with the lime scale and another dose of Season Treat is needed. After every third addition of acid, flush the system and add fresh water before dosing again.
 - The system is free of scale when the solution retains a green or light blue color for 20-45 minutes. If it is not possible to observe the solution color, use the pH test strips, included with the package to determine whether the solution has been neutralized. Do not leave Season Start in the system longer than necessary to remove scale build-up and never longer than 24 hours.
- After cleaning, thoroughly rinse system with flowing water, making sure any residues from the process have been thoroughly flush.
 - Discard solution by following local regulations.

Tonnage - Cooling Towers, Shell and Tube Condensers	Initial Dosage*		
	Liquid Scale Dissolver	Eco-Lyme	Season Start
10	2 gallons	4 gallons	10 lbs.
25	5 gallons	10 gallons	30 lbs.
50	10 gallons	20 gallons	50 lbs.
100	20 gallons	40 gallons	75 lbs.
150	25 gallons	50 gallons	125 lbs.
250	50 gallons	100 gallons	200 lbs.
500	100 gallons	200 gallons	400 lbs.

* Dosage recommendations are for condensers that receive periodic or annual water descaling maintenance. When maintenance is neglected and adverse amount of confirmed scale present, additional Nu-Calgon descaler (and time) will be required.

Application Considerations

- The amount of acid required to completely clean the system depends upon the amount of scale present. It takes about 2 pounds of powdered acid or 1/3 gallon of Liquid Scale Dissolver to react with one pound of lime scale, and several doses of acid may be necessary to remove heavy scale deposits. No more than three doses of acid should be added to the water without flushing. If scale is heavy, it is better to drain the spent cleaning solution and repeat the cleaning procedure with a fresh charge.
- Higher temperatures, greater solution strength and faster circulation rate increases the speed of dissolving scale. The temperature of the acid cleaning solution should be kept high whenever possible but never allowed to go over 160°F.
- Be careful about using acids where there is any danger that the recirculating water containing the acid may be carried away by air or be drained or splattered on personnel, on surrounding concrete surfaces, grass, plants, automobiles, buildings or other surfaces that might be affected by the acid solution.
- It is safe to leave powdered scale remover in a system for up to 24 hours as long as the parts are not corroded. However, a system where piping is thin or held together by old scale or corrosion products should be checked constantly and flushed as soon as head pressure is normal. Never leave strong liquid acids in a system for more than 6 hours.
- After the cleaning job is finished, the acid solution should be thoroughly flushed from the system and all lines checked to make sure they are not blocked by any loose and undissolved scale or other materials.
- Repeated acid cleaning will eventually remove protective galvanizing from all metal surfaces. Hot dip galvanizing can withstand several cleanings before an appreciable amount of the galvanizing is removed, while electroplated steel will likely lose its thin galvanizing coating after one cleaning. Although there is no known inhibitor that provides complete protection to galvanizing when copper corrosion products or copper salts are present in the system, laboratory tests have shown that Season Start Scale Remover can provide excellent protection under these conditions.
- Die-cast or “white metal” parts are subject to rapid attack by any acid.
- It is not unusual to find both copper and steel parts in a recirculating cooling water system. When installed in an all-copper system, the steel parts can corrode rapidly by electrolysis, resulting in water leaks. In many cases corrosion products build up on the steel parts, plugging up the water. Do not use acid to clean a system in this condition, or failure of the fittings or the condenser may result. Where rapid corrosion of steel parts occurs, replace the steel parts with ones of non-ferrous metal.
- In some evaporative condensers where water is sprayed directly on copper tubes at high velocities, rapid attack may occur where the spray hits the coil, particularly when strong liquid acids are used. In these cases, use a separate acid pump to recirculate the cleaning solution over the tubes in a gentle stream. Abnormally high velocities through water cooled condenser tubes can cause the same type of rapid attack, particularly at points where the direction of flow is changed.

Cleaning Individual Condensers with an Acid Pump

When cleaning the condenser with **No. 31-TX1 Acid Pump (4603-0)** mix no more than 1 pound of Season Start for each gallon of water, 1 gallon of Liquid Scale Dissolver for each 5 gallons of water, or 1 gallon of Eco-Lyme for each gallon of water. Circulate the acid solution. Check the circulating solution periodically with pH test paper to ensure that it remains at the proper acid strength. Always clean the pump by pumping clean water through the device to extend its service life.

