# De-scaling – Method


The primary reasons for chemical cleaning of boilers / heat exchangers are to prevent tube failures & improve unit availability. Tube failures in low pressure boilers / heat exchangers are normally the results of creep which occurs when internal deposits produce excessive metal temperature. A relatively smaller quantity of deposit, creates difficulties in high pressure boilers. Caustic corrosion & hydrogen damage, which occur only in the presence of deposits, may cause tube failures at temperatures well below the creep limit. Deposits originating both from fabrication & during operation should be considered potential problems.

All the pressure parts of steam generator may be subjected to heat treatment of some sort during fabrication or erection – during forming operations, stress relief, welding or bending. Whenever carbon low alloy steels are subjected to high temperatures in the presence of air, oxidation occurs, the oxide produced is known as mill scale. Mill scale on boiler / heat exchanger tubing is normally very thin with the exception of areas near welds & bends. Even where mill scale is initially uniform its brittleness upon cooling may produce flaking. The resulting non-uniform surface is undesirable from the standpoint of corrosion susceptibility. During operation mill scale is rapidly eroded from the steam generating surfaces & may subsequently be redepositing in critical areas. Preoperational acid cleaning removes mill scale & serves to remove atmospheric rust which inevitably accumulates to some degree during erection.

After a boiler / heat exchanger placed into service, numerous solid constituents may enter the units with the feed water & some portion of the insoluble can be expected to deposit on surfaces. If not removed these deposits accumulated over a period of time can minimize the quantity of these materials; however, complete freedom from deposition is not possible in a high pressure system. The need for occasional chemical cleaning during the life of the equipment has become a recognized fact & should be accepted as a routine maintenance practice. A frequency of service cleaning depend on the Water Chemistry and Operation conditions



**BARON Chemicals & Systems (P) Ltd**.
H-5/ 21, Krishna Nagar, Delhi-110051. Tel:011-22418572, Mobil 9810158931 Fax 91-11-22023200

# DESCALEX-1101/1104

## Product Benefits

Descalex-1104 Change its color from redish to Blue afer lossing its concentraion

- Attacks rust, scale and deposits but not on the base metal.
- Cleans complex equipment without dismantling.
- Penetrates and disperses acid soluble deposits.
- Provides moderate foaming to minimize acid fuming.

## Principal uses:

1. DESCALEX-1101/1104 quickly removes hardness and metal oxide deposits from boilers, heat exchangers, condensers, evaporations. cooling jackets, process vessels, piping and other equipment. It can be used while the equipment is on-stream or shut down.

2. DESCALEX-1101/1104 can be used for removes of rust and oxide / heat scale along with black oxide coating and chromium, zinc, And cadmium plate via the "immersion dip method" in metal processing applications.

3. DESCALEX-1101/1104 can also be used to chemically clean well screens. It removes hard water scale, corrosion Products and iron deposits

## Note:

1. *DESCALEX-1101/1104 is normally not recommended for Stainless Steel, Aluminium, Galvanized Metals, or zinc Alloys. An exception would be one-time cleaning of stainless steel parts in a metals shop where chloride stress corrosion is not a factor.*

2. *Aluminium, zinc, galvanized metals and some stainless steels are attacked by Descalex-1101/1104. Pre-testing in the desired solution is recommended if these metals are present.*

**General Description**

DESCALEX-1101/1104 is a carefully engineered blend of HCL with an acid inhibiting and surfactant chemical. The surfactant increases deposit penetration and provides controlled foaming action.

| | |
|---|---|
| **Form** | Liquid |
| **Colour** | Colourless to Yellow |
| **Flash Point** | None |
| **Specific Gravity** | 1.14 |
| **PH (1% Solution)** | 1.45 |
| **Density** | 1.13 gm/cc |
| **Odor** | Acidic, pungent |
| **Freezing Point** | < -- 46$^{o}$C |
| **Rinsability** | Excellent. |



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**Data of Descalex-1101 /1104 & Inhibited HCL**

| **Test conditions:** | | **Descalant 1101** | **Descalant 1104** | **HCL With Inhibitor** |
|---|---|---|---|---|
| Concentration | : | 10% | 10% | 10 % |
| Temperature | : | $60^0$C | $60\ ^0$C | $60^0$C |
| Duration | : | 24 hrs. | 24 Hr. | 24Hr. |

| **Metal** | **Metal Loss** ($g/cm^2$/24 hrs.) | **Metal Loss** ($g/cm^2$/24 hrs.) | **Metal Loss** ($g/cm^2$/24 hrs.) |
|---|---|---|---|
| Brass | 0.000909 | 0.000003545 | 0.001132 |
| Copper | 0.000701 | 0.000004005 | 0.001130 |
| M.S. | 0.005899 | 0.000067899 | 0.0574 |
| Aluminum | - | - | - |
| Stainless steel 316 | - | - | 0.001511 |

## Application:

- Off-stream soaking

*General*

*Dosage* - Suggested solution strength is 1 – 5% by weight. One liter of DESCALEX-1101/1104 will remove approximately 0.7 – 0.95 kg of scale. More rapid cleaning can be achieved with a 10% solution, but corrosion potential is increased, especially if elevated temperatures (54-60$^o$C) are used.

*Solution Temperature* – Cool solution of DESCALEX-1101/1104 will dissolve scale, but the action speeds up as the temperature increases . Normally 49 - 54 $^o$C is suggested with a maximum of 60 $^o$C.

*Cleaning Time* – Generally 2 – 12 hours – varies with dosage, solution temperature, type and amount of scale of deposit.

## Procedure

1. Connect a hose or piping to the lowest inlet on the equipment and extend it above the highest outlet to prove sufficient head for complete filling.

2. Install (for closed systems) a vent line to a top outlet to provide for safe removal of gases formed during cleaning. The vent outlet sparks and areas where possible discharge might splash on workers or equipment.

3. Clean (boil-out) equipment with DESCALEX-1105to remove oil, grease, dirt, sulfate & organics at 10% solution for 4 hrs. soaking.

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4. Clean & wash with D.M. or Soft water.

5. In a separate tank, make up the required solution of DESCALEX-1101/1104 in water – **always add acid to water.**

6. Introduce DESCALEX-1101/1104 solution gradually through the hose or piping via a rubber or polyethylene funnel. If the solution is not pre-mixed, fill the unit approximately 50% with water, add required DESCALEX-1101/1104 and then completely fill with water.

7. Allow equipment to stand for 4- 8 hours until scale has been removed or DESCALEX-1101/1104 has been exhausted. Titration with DESCALEX-1101/1104 Control Test will indicate solution strength. Descaling may be considered complete when the pH remains constant (in the 1.5-2.0 range) for 15-30 minutes. If the descaling is not complete after 8-12 hours, the unit should be drained and a new solution added. This is required because dissolved iron salts may catalyze corrosion.

8. After descaling is complete, flush out loosened, scale with fresh water and neutralize unit with 2% solution of DESCALEX-1105(caustic soda or soda ash can be substituted).

- **Off-stream Circulation**


## General

Dosage, temperature and time information same as "off-stream soaking".

## Procedure

1. Clean (boil-out) and thoroughly rinse equipment with DESCALEX-1105to remove oil, grease, dirt, sulfates, organics and silica.

2. Wash and rinse with water

3. In a separate tank, make up the required solution of DESCALEX-1101/1104 in water **- always add acid to water.**

4. Using an acid – resistant or expendable pump, circulate the cleaning solution through the equipment from the bottom up to ensure contact with all pockets. Intermittent circulation may accelerate the cleaning action. (e.g., run the pump one out of every five or ten minutes.)

5. Titrate Solution with DESCALEX-1101/1104 Control Test. Descaling may be considered complete when the pH remains constant (in 1.5-2.0 range) for 15-30 minutes. If descaling is not complete after 8-12 hours, the unit should be drained and a new solution added. This is required because dissolved iron salts may catalyze corrosion.

6. After descaling is complete, flush out loosened scale with fresh water and neutralize unit with fresh 2% solution of DESCALEX-1101/1104 (caustic soda or soda ash can be substituted)

- **On – Stream descaling**

## General.


Dosage – Dosage will depend on the amount of scale in the system. One liter of Descalex-1101/1104 will remove approximately0.7 – 0.95 kg. of scale. Suggested minimum solution strength is 0.1 – 0.5% (by weight).

**T**emperature - Suggested maximum is 60$^{o}$C.

## Procedure

1. Reduce the flow of water through the equipment to as low a rate as possible.

2. Pump a concentrated (25-50%) solution of DESCALEX-1101/1104 in to the water on an intermittent basis. This allows full water flow to be restored periodically to minimize temperature buildup.

3. Stop chemicals feed it equipment starts vibrating from pressure buildup during cleaning. Slow cleaner injection may be resumed when vibration ceases.

4. Cleaning effectiveness is determined by:

   - **Dissolved solids** testing on cleaning solution during cleaning. A "Bell Curve" for D.S indicates complete cleaning with a constant pH between 1.5 and 2.0

   - **Heat transfer rates** (temperature readings) can be used as indicators of cleaning effected.

   - **Increased flow rates** also reflect desired cleaning.

- **Parts Cleaning – Immersion**

## General

*Solution Strength* – Varies from 5% to a neat (100%) solution of Descalex-1101/1104

Solution temperature – Cool solutions are recommended because of high concentration used and possible corrosive fumes.

Cleaning time – Will vary with concentration, type and amount of deposit.



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## Procedure

1. Thoroughly clean equipment of parts with an alkaline Descalex- 1105 to remove oil, grease and dirt.
2. Rinse in clean water (warm or hot if available)
3. Immerse Descalex-1101/1104 solution descaling / derusting.
4. Remove part and rinse with warm or hot water. Immediate drying after rinsing will minimize "flash rusting".
5. Parts may be dipped in Descalex-1101/1104 water – displacing or soluble oil inhibitor after acid cleaning to provide storage corrosion protection.

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# Handling and Storage

**Warning:** Causes burns. Do not get in eyes, on skin or on clothing. Wear goggles or face shield when handling. Avoid breathing of vapor. Use with adequate ventilation. Do not take internally. Keep container closed when not in use. In case of contact, immediately flush with large amounts of water for at least 5 minutes; for eyes, also get medical attention. Remove contaminated clothing.

**Other Handling procedure:**

1. Keep drum upright to prevent leakage.
2. Keep drum out of sun and away from heat, oil, and grease.
3. Relieve internal pressure when received and at least weekly thereafter by slowly loosing closure.
4. Never use pressure to empty the drum.
5. Replace closure after each withdrawal.
6. In case of spillage, flush with large amounts of water.

**Caution:** During use, keep solutions of Descalex-1101/1104 away from flames or points of ignition. Various gases may be generated. Provide adequate ventilation.

**Descalex-1101/1104 / 1105 has a shelf life of 2 years**

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## Safety Practices

1. Do not permit Descalex-1101/1104 or prepared solutions to come in contact with skin or clothing or to splash into eyes.

2. Do not permit Descalex-1101/1104 to splash on concrete floors, as it attacks lime in the concrete. If solution does get on concrete surface, apply an alkaline solution to neutralize.

3. Descaling operations should be performed away from all fire, sparks or other ignition sources.

4. Depending on type of scale being removed and the metals with which the solution will come in contact, various gases will be formed. Under ordinary conditions the action of Descalex-1101/1104 solution on lime scale and rust results in the formation of harmless gases. However, when the solution comes in contact with Aluminium, Zinc, Cadmium, tin, sulfates, arsenic or cyanides, other gases, some poisonous and some explosive may be generated. The best practice when descaling is being done is closed equipment is to install proper ventilation to carry the gases away. When an open tank is used gases should be diluted by adequate air flow above the tank.

5. Always fill closed units from the bottom up.

6. Be sure that there are no leaks in heat exchange systems that will permit the solution to leak into the opposite side of the solution. Good practice is to fill the opposite side with water to a level higher than the Descalex-1101/1104 solution

7. Use an acid-proof or an expendable pump.

8. When mixing with water, **pour Descalex-1101/1104 in to water**, **never add water to acid**.

9. Do not agitate acid solution with air.

10. Application of Descalex-1101/1104should be followed by a through rinsing, then neutralization with Descalex-1101/1104 to remove all acidic residue.

11. If the Descalex-1101/1104 is to be held for any length or time, either an acid-proof, wooden or synthetic rubber lined steel con short-time, either an acid-proof, wooden or synthetic rubber lined steel container should be used. For short-time holding (8-12 hours maximum), an ordinary steel is acceptable.

12. If possible, dissimilar metals should be removed prior to descaling to prevent electronic action that might interfere with inhibiting action. Do not use Descalex-1101/1104 to descale Zinc, Aluminum, Stainless or Galvanized metals.



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**Disposal** Consult with the appropriate regularity agency concerning requirements for discharge of acid solution.

**Shipping** Descalex-1101/1104 is shipped in non-returnable, 200 Ltr. Drums containing approximately 232 Kg. Net weight and also in 30 liter jerry cans containing approximately 35 kg net weight.

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H- 5/21, Krishna Nagar, Delhi-110051.
Tel No. 91-11-22418572,22056393
Fax . 91-11-22056393
Email: info@baronchemicals.com
www.baronchemicals.com