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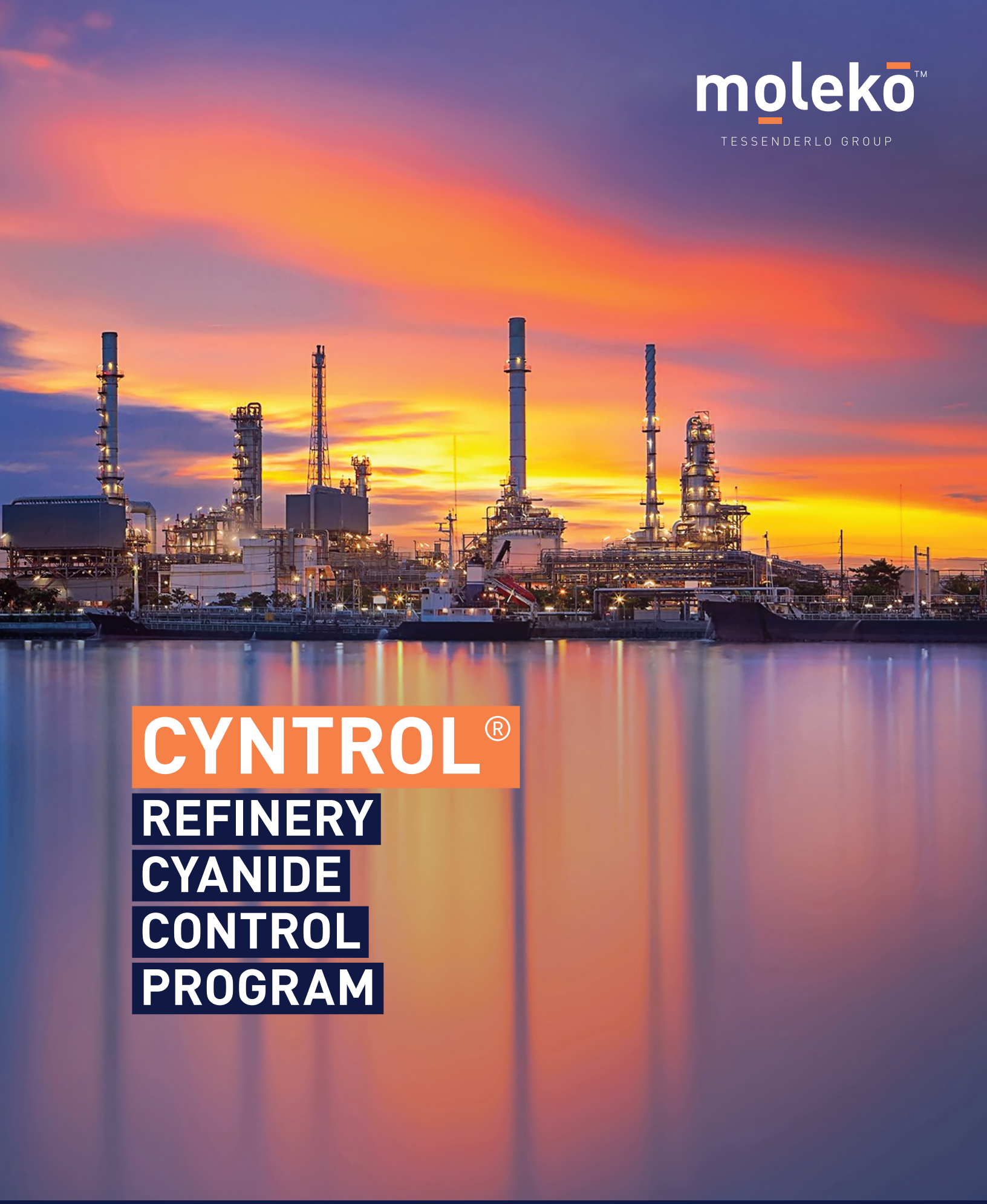


# CYNTROL®

## REFINERY CYANIDE CONTROL PROGRAM

MOLECULES ON THE MOVE

# CYNTROL® (AMMONIUM POLYSULFIDE SOLUTION)

## Works in refinery applications to convert cyanide into a non-corrosive thiocyanate, protecting equipment from corrosion.

Catalytic cracking and coking operations in a refinery typically generate some amount of cyanide due to the presence of nitrogen containing compounds in crude oil. These cyanides, if present in sufficient concentration, can have a deleterious effect on refinery operations, due to their promotion of **hydrogen related corrosion**.

While other corrosion inhibitors, such as filmers, protect equipment by forming a barrier between the metal and the corrosive agent, the cyanide still exists and is passed along to other units within the refinery. Cyntrol effectively eliminates the cyanide by converting it to a **non-corrosive thiocyanate** that is easily handled in the refinery's water treatment facility.

## BENEFITS

- Prevents cyanide from attacking the passivated iron sulfide layer in refinery equipment
- Strengthens protective passivated layer by converting FeS to $FeS_2$
- Extends life of expensive refinery equipment
- Improves efficiency of wash water system, as more cyanide can be solubilized into the wash water
- Untreated cyanide can lead to reduced efficiency in the amine system through formation of heat stable salts
- Reduces potential environmental issues

## TYPICAL PROPERTIES

| | Cyntrol 2040 | Cyntrol 2045 |
|---|---|---|
| Active Ingredient (ammonium polysulfide) | 49% | 55% |
| Specific Gravity | 1.125 – 1.150 | 1.145 – 1.175 |
| Appearance | Ruby red liquid | Ruby red liquid |
| pH | 10.8 – 11.5 | 10.8 - 11.5 |
| Vapor Pressure | 41.86 kPa @ 68°F (314 mm Hg at 20°C) | 41.86 kPa @ 68°F (314 mm Hg at 20°C) |
| Freezing Point | 5°F (-15°C) | 5°F (-15°C) |
| Boiling Point | 100°F (38°C) | 100°F (38°C) |


**PRE-TREATMENT**

Iron sulfide (FeS) visible from cyanide corrosion

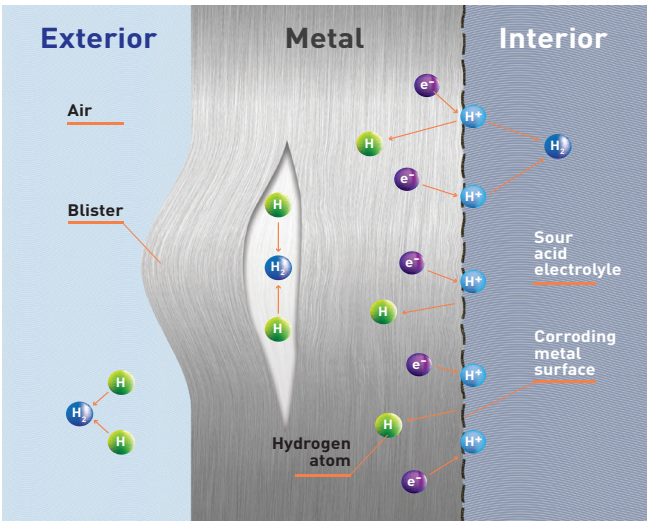
**POST-TREATMENT**

FeS-free, Cyntrol treated

## HYDROGEN BLISTERING CORROSION

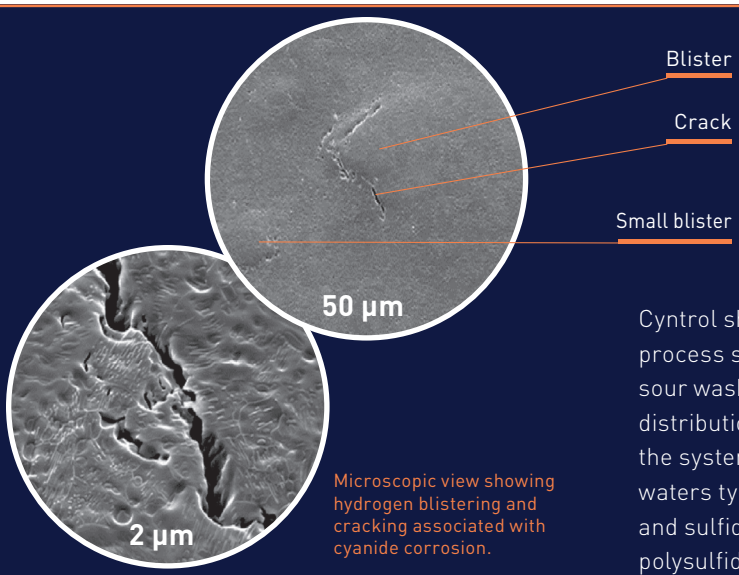
In addition to removing the passivated iron sulfide layer, the cyanide, along with the hydrogen sulfide ($H_2S$) also present in refinery sour wash water, suppress the formation of molecular hydrogen ($H_2$) thereby allowing the atomic hydrogen to diffuse readily into a metal's structure. This process diminishes the mechanical integrity of many metals and alloys and leads to hydrogen induced cracking (HIC).

HIC is generally first evident as blister formation in the vessel inner surface. Cracking can then occur when the atomic hydrogen precipitates as $H_2$ and the resulting pressure exceeds the tensile strength of the already diminished metal structure.




Hydrogen blistering in the wall of a container.
https://faculty.kfupm.edu.sa/me/hussaini/corrosion%20engineering/Images/Hydrogen-wallblister.jpg

**Cyntrol is typically suitable for addition as part of system wash waters, at moderate temperatures (50 – 230°F) in a slightly basic environment (pH of 8.0 – 10.0). The reaction between the polysulfide and cyanide ions is an aqueous phase reaction.**




Microscopic view showing hydrogen blistering and cracking associated with cyanide corrosion.

Cyntrol should be injected into process streams containing sour wash water to provide good distribution of Cyntrol through the systems to be treated. Sour waters typically contain ammonia and sulfides which help keep polysulfides in solution.

## DOSAGE

**Dosage is typically adjusted to convert all cyanide to thiocyanate while maintaining a small residual of Cyntrol (roughly 10 PPM) in the wash water.**

A general starting dosage guideline is about 0.00135 gallons per hour of Cyntrol is needed per GPM of wash water containing one PPM of cyanide.

| Cyntrol Dosage (gal/hr) | = | Wash water (GPM) | X | Cyanide level (PPM) | X | 0.00135 |
|---|---|---|---|---|---|---|

For example, a 40 GPM flow with a 25 PPM cyanide level would require 40 X 25 X 0.00135 = 1.35 gallons/hr Cyntrol injection.

## PACKAGING AND HANDLING

- Product is available in bulk tank trucks for transfer to on-site storage tanks
- Storage tank considerations include:
- An appropriate nitrogen pad, or system venting through an appropriate scrubber system
- A barrier fluid to minimize vapor generation
- Avoid direct sunlight and incompatible materials/ chemicals
- Maintain at moderate temperatures in a well-ventilated area
- Avoid contact with skin and eyes
- Wash thoroughly after handling
- Observe all safety precautions listed in the safety data sheet (SDS).

## SURVEY SERVICES

**moleko** offers on-site technical survey services to help determine if refinery processing units are producing excess cyanide. By testing sour water samples from various points throughout the refinery, technical staff can make informed decisions about where cyanides are generated and where they are being moved, impact of cyanide on the refinery, effectiveness and efficiency of wash water system, and make recommendations for process improvements. A summary report of the results and observations is provided following the survey. Typical results include WAD cyanide, pH, ammonia, sulfides, thiocyanates (if currently using Cyntrol), and physical appearance (color, turbidity, solids, and hydrocarbons).

**Cyntrol significantly reduces the potential for cyanide assisted corrosion and the presence of cyanide in the refinery's waste water effluent.**

## CONTACT US FOR A TECHNICAL ASSESSMENT

SCAN ME

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