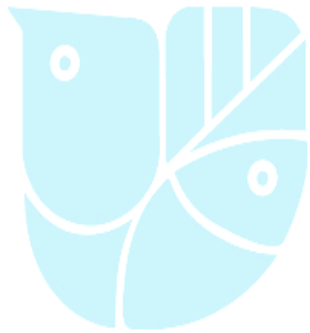

SYMEC

INTERNATIONAL DIVISION



SYMEC S.A.
TRATAMIENTOS BIOLÓGICOS

PRODUCTS AND SERVICES

SYMEC S.A. is an argentine company with products and services which convert contaminant hydrocarbons into water and carbon dioxide.

Its **Assisted Bioremediation** is the most economical process to reduce hydrocarbons content below the maximum legal limits. Treatment times usually do not exceed 120 days.

Some of the contaminations we treat:

- * Soils and waters contaminated with hydrocarbons
- * Drilling muds (oil and diesel base)

How Assisted Bioremediation works

Nature by itself decomposes organic compounds (hydrocarbons are some of them) made of Carbon, Hydrogen and Oxygen into carbon dioxide and water – CO₂ and H₂O. This is performed by the "indigenous bacteria" found in soils. The process could take from years to millenniums, depending on conditions of the surroundings: presence of water, pH, etc.

Assisted Bioremediation consists, basically, in accelerating many times this natural process through the addition of massive amounts of bacteria, water, enzymes and nutrients.

- * First, we select the bacteria more apt to degrade the specific contaminant.
- * We then proceed to multiply them in the lab.
- * We add enzymes and nutrients and then deactivate the bacteria temporarily putting them into "latency".
- * The mere addition of water reactivates them.
- * Each time a bacteria decomposes a hydrocarbon molecule into CO₂ and H₂O it divides into two, thus the colony grows while "food" lasts, dying when this is exhausted.
- * They are incorporated into the water used to irrigate the contamination, when they become active again.
- * Thus they fulfil their degradation work, multiplying themselves, "eating up" the contaminant. The only remains are CO₂ and H₂O.
- * As a result, contaminant hydrocarbons are reduced at the rate of 50% every 30 days of treatment. Typically it takes between 60 to 120 days to reduce hydrocarbon contents below the maximum allowed limits.

Examples

In the Annex we show the oil reduction curves for works performed in Mexico and Argentina.

All the results shown here are determined by independent labs chosen by the customers or the environmental control authorities. The latter approve the "decontaminated" material.

Remediation systems: the alternatives

There are basically only three systems to eliminate contaminant hydrocarbons in a reasonable lapse of time:

- * Oxidation
- * Thermal treatment (incineration) with cement-type ovens
- * **Assisted Bioremediation**

The first two alternatives cost several times more than Bioremediation.

Incineration requires huge investment in ovens and the process vents fumes which increases the "greenhouse effect". It also requires costly transportation to the oven sites, while Bioremediation can be applied "on site".

Oxidation has the advantage of being a faster process: days against months for Bioremediation.

Pre-oxidation plus bioremediation

There are certain contaminants which are not easily disposed by bacterial processes. In many of these cases (notably drilling muds, heavy asphalts) we apply **preoxidation**, after thoroughly mixing mechanically the contaminated material, breaking up as much as possible the solids. Afterwards, the bacteria can do its job.

The combination of both, at a cost of only a fraction of total oxidation, allows full remediation in less than 90 days (typically) to lower hydrocarbons content below the legal maximum limits.

We are presently treating drilling muds for two large oil companies in Argentina with this combined process.

Old contaminations (drilling pits which have sat open for decades) contain large amounts of solids (asphaltic) which can be thus remediated effectively and in short treatments.

Some work completed

For decades there was little pressure exerted on the Argentine oil companies. Abandoned drilling pits dot the landscape. They are countless huge repositories where contaminated material was dumped.

So in the last years we tackled the Mexican market. Environmental authorities in that country hold tight requirements, similar to those in the U.S. Our bacteria and know-how have treated there over 500.000 m³ of contaminated soils.

Since 2002 we export our bacteria. Recently we sold to our Mexican associates a turn-key manufacturing plant and lab which is being currently set up.

Our local delegate is available for support to North American neighbours.

In the Annex we show contaminant reduction curves for Mexican (PEMEX) and Ecuadorian works.

In Acatzingo, Mexico, an oil spill produced by the rupture of a duct, inundated 27 ha. After 120 of our treatment, radishes were again harvested, showing no trace of hydrocarbons.

In Argentina, environmental control was transferred to the provinces. A growing world concern for these matters has also pressured the oil companies, now helped by the high price of oil. Lawsuits were filed by property owners and affected neighbours. Some of them against oil companies directors' personally.

As a consequence, our billings have now "exploded". We are the only ones in the market who can deliver remediation at the lowest costs, and most effectively.

We have done services to the most important local oil companies: among others, Petrobras, Repsol, Tecpetrol.

Typical jobs

- * Remediation of repositories with contaminated soils
- * Drilling pits
- * Oil spills caused by transportation incidents
- * Refinery or tank yards contamination
- * Drilling muds

In all cases we have detailed reports of procedures and results, supported by independent labs and environmental control authorities.

We are registered as remediators in all the oil producing provinces in Argentina.

Production of bacteria

In 2001 a sudden peso devaluation made economically unfeasible to import bacteria to Argentina (which we did up till then from the U.S.).

We started our own local production. Quality was good enough that Mexico chose to import them from us rather than from its neighbouring United States.

Cold climate bacteria

Regular bacteria do not function below 10°C. If we put them in a refrigerator, they "sporulate", or go into latency. They neither "eat", nor multiply.

Thus bioremediation, either with indigenous or cultivated bacteria is not possible in cold climates. It requires heated bio piles, at costs many times higher than regular bioremediation, almost equivalent to oxidation or incineration.

SYMEC isolated "oil eating" bacteria which functions down to -4°C. They work in frozen ground or under snow.

These allow our treatment to work 24 hours by 365 days in southern Argentina (where most of the oil is found).

We have already completed successfully jobs for companies as Repsol, Petrobras, PAE (British Petroleum) and Tecpetrol in the middle of winter.

As the only world producers of this Low Temperature Bacteria we feel that new markets are opened to it now in northern America, Europe and Asia. This LT bacteria makes possible the use of **Assisted Bioremediation** in cold climates, which were closed to it up to now.

It will be the most economical to remediate contaminations, by far.