

GREEN TECHNOLOGY



Before: Soils heavily contaminated by coal combustion at the Pinto Power Station in Pasang. After: The soil has been treated using effluent microbes, after which the grass has grown.

A new natural clean up process

A full year ago, environmentalists became concerned in a process that affects not financial charity to the environment. It is natural processes that affect the environment, because there are microorganisms that live in the soil to break down compounds, the microbial threat based on bacteria and fungi.

However, the soil and groundwater must be the right temperature, and have the right amount of nutrients and equipment available for these microbes to clean up the contamination. The microbes improve the environment's ability to absorb and remove gross pollutants. This is vital because the conditions of the soil are right, the microbes and grass are ready to do. If the conditions of the soil are not suitable for treatment, then the nutrients and other substances are supplied to the soil.

This process is a very safe way to treat the soil, because there is no physical or chemical treatment, while the nutrients that are added to help the microbes grow and ones that can naturally grow to flourish.

IMPROVING THE PRODUCT

In 2002, the project was successfully carried out by Pinto Research (PDR), the in-house laboratory operated by Singapore-based utility operator the Pinto Power Station in Pasang.

"The objective of using biomass treatment plants from the Department of Environment in Pasang, it was to try to develop the site in that technology of the biomass not only to fulfill also to Malaysia. So, we managed to identify who to do the technology implementation. And knowledge of basic technology of work, and apply that concept with the knowledge of biomass plants based on successful work from the Department of Environment from abroad," says Dr. Mulyadi Huda Ahmad, Head of Pinto's Environmental Unit and Project Director of its Biomass treatment project.

The power generated from a plant of 100MW power plant and the



Before: water



After: water

effluent water contaminated by treatment and removal of the Pinto Power Station in Pasang.



Dr. Mulyadi Huda Ahmad, Senior Researcher and Project Leader of the Biomass project.

With clear glass he briefs



Ahmad Nasir Sadiq, Researcher for Environment at PDR.



Dr. Mulyadi Huda Ahmad, Head of Pinto's Environmental Unit and Project Director of its Biomass project.

involvement of the treatment units, making the monitoring such, although of importance of accuracy and this requires care because the way the switch patients, passing through the upper layer of soil. These treatment were developed by the Department of Environment's environmental unit which are capable of performing the microbial treatment.

To identify the objective, PDR Research carried out a study on the bioconversion of oil-contaminated soil using effluent microbes. Effluent microbes are a kind of probiotic technology that can decompose about 25 percent of oil-based oil effluent and effluent remediation.

The effluent microbes were produced originally from the contaminated soil itself. Assessing and assessing of these oil-degrading microbes suitable to be used in treating the oil-contaminated, says Dr. Mulyadi Huda Ahmad, Senior Researcher and Project Leader of the Biomass project.

"We want the local environment consider the environment because the microbial technology is a way to reduce the cost of treatment and application of the effluent microbes from abroad. They may have high potential to treat the effluent microbes because they have died," he says.

PROBLEMS THE TEAM, WITH EFFLUENT

"One of the difficulties of effluent microbes

is that they are not able to effectively capture Ahmad Nasir Sadiq, Researcher for Environment at PDR. The first stage of treatment is difficult and during this stage of treatment the biological and physical needs of naturally occurring microbes are satisfied. From this study it has been illustrated that production of effluent microbes is through a combination of many microbial species.

The second stage of the treatment is the assessment of the environment and geographical analysis that is an environmental monitoring and assessment of a property's condition and environment of potential surface water contamination. This stage is to evaluate contamination risk areas within the environment and the accessibility of the environment.

In the final stage of the treatment, a surface physical treatment technique was obtained at the site contaminated area. This treatment to reduce the oil-contaminated compound easily including the combination of effluent microbes described "Kunci

contaminants.

Sharing the basic stage treatment are developed and effluent microbes are produced at a large scale. The last stage of treatment involves developing techniques and approaches to reduce the volume of effluent microbes. During this stage, the effluent will be more distributed back from the treatment area to its original place. The surface layer of the soil is then covered

BENEFITS BY BIOMASS
"There are a lot of arguments, although clean-up methods are more difficult, biomass, we feel that bioremediation is more effective to clean the environment of harmful chemicals than more dangerous. For one, it is a mixture of treatment that is very cost effectively compared to the use of treatment," says Dr. Ahmad.

As a remediation costs only one-half the treatment, it does not harm to the environment. The microbes will eat the hydrocarbons and convert it to biomass substances. But surface disease, water and soil treatment, then, pose no threat to the environment.

"PDR's conventional methods of remediating oil-contaminated areas are currently common, although the risk of a more biological approach to treated of an oil-contaminated area is greater, the remediation techniques are at minimum in the open-pit and surface mining operation," he says.

PDR has now further developed the technology on effluent microbes. This will allow it to clean the environment more effectively to be used in any oil-contaminated soil after the treatment.



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Before (Inset): Soil contaminated by transformer oil at the Perai Power Station in Penang. After: The soil was remediated using effective microbes, after which cow grass was planted.

A new natural clean up process

A NEW and innovative process, bioremediation is a process that helps rid harmful chemicals in the environment. A natural process that does not harm the environment, bioremediation uses microbes that live in the soil to remediate contaminants, for example those found in gasoline and oil spills.

However, the soil and groundwater must be the right temperature, and have the right amount of nutrients and oxygen in order for these microbes to clean up the contaminants. The microbes degrade the contaminants and change it into water and harmless gasses like carbon dioxide. This is vital as when the conditions of the soil are not right, the microbes will grow too slowly or die. If the conditions of the soil are not conducive for bioremediation, aeration, nutrients and other substances are supplied to the contaminated area.

This process is a very safe one as the microbes pose no threat to people who are conducting the bioremediation or the community while the nutrients that are added to make the microbes grow are ones that are commonly used in gardens.

PIONEERING THE PROJECT

In 2009, bioremediation was successfully carried out by TNB Research (TNBR), the in-house solution provider for Tenaga Nasional Berhad, at the Perai Power Station in Penang.

"The initial idea of using bioremediation came about from the Department of Environment in Penang. It was a big challenge for us as the technology at that time was new not only to TNB but also to Malaysia. Still, we managed to identify a local microbiology expert who had knowledge of basic microbiological work and application coupled with the knowledge from literature reviews based on successful areas treated using bioremediation from abroad," says Ir Mohd Noh Ahmad, Head of TNBR's Environmental Unit and Project Director of its bioremediation project.

The power station had demolished some of its old power plants and dis-

mantled some of the transformer units. During the dismantling work, spillage of transformer oil occurred and this spillage contaminated the soil near the switch yard area, seeping through the upper layer of soil. These contaminants were classified by the Department of Environment as scheduled waste, which are spillages of potentially harmful contaminants.

To remedy the situation, TNB Research carried out a study on the bioremediation of oil-contaminated soil using effective microbes. Effective microbes are a natural, probiotic technology that was developed more than 25 years ago based on beneficial and effective microorganisms.

"The effective microbes were produced originally from the contaminated area itself. Isolation and screening of these oil degrading microbes enabled us to utilise them in treating the contamination," says Shahril Mod Husin, Senior Researcher and Project Leader of the bioremediation project.

"We used the local microbes to treat the contaminants because no harmful contaminants would be created if the microbes die. But if we used off-the-shelf microbes from abroad, they may have had potential to create harmful chemicals should they have died," he adds.



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TREATING THE SOIL WITH EFFECTIVE MICROBES

Five stages of effective microbes

treatment were developed in this study, explains Ahmad Nazri Saidin, Researcher for Bioremediation in TNBR. The first stage of treatment is isolation and during this stage of treatment the biological and physical needs of naturally occurring microbes are isolated. From the study it was discovered that production of effective microbes is through a combination of many microbe species.

The second stage of the treatment is the environmental site assessment and geophysical analysis that is an intrusive investigation and assessment of a property to identify and determine the presence, nature and extent of potential subsurface contamination. This stage is to establish contaminant risk level, both the extensiveness and the intensiveness of the contamination.

"In the third stage of the treatment, a suitable physical separation technique was developed at the contaminated area. This treatment is to reduce the contaminants concentration by reducing the contamination the degradation period is shortened" Nazri continues.

During the fourth stage, inoculums are developed and effective microbes are produced on a large scale. The final stage of treatment involves developing techniques and approaches to enhance the treatment of effective microbes. During this stage, post-treatment is conducted where the treated soil is then transferred back from the treatment area to its original place. The surface layer of the soil is then covered

with cow grass for landscaping.

BENEFITS OF BIOREMEDIATION

"There are a lot of arguments on which clean-up method is more effective, however, we feel that engaging in bioremediation to relieve the environment of harmful chemicals has more advantages. For one, it is a method of treatment that is very cost-effective compared to the cost of incineration," explains Nazri.

As bioremediation uses only natural treatment, it does no harm to the environment. The microbes are able to degrade contaminants to harmless substances like carbon dioxide, water and cell biomass that pose no threat to the environment.

"While conventional methods often require personnel to come in close contact with contaminants, which run the risk of a more widespread exposure in the event of an accident during clean up procedures, bioremediation keeps risks at a minimum as the process degradation takes place naturally," he adds.

TNBR has now further developed the identified an effective microbe consortia. This will allow it to get the maximum treatment efficiency to be applied in any oil-contaminated soil within the TNB premises.



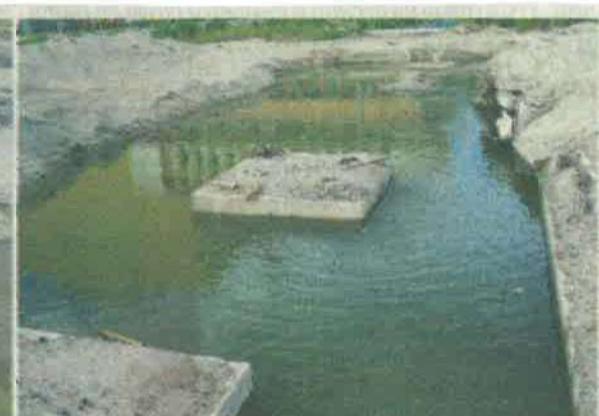
Shahril Mod Husin, Senior Researcher and Project Leader of the bioremediation project.



Ir Mohd Noh Ahmad, Head of TNBR's Environmental Unit and Project Director of its bioremediation project.



Ahmad Nazri Saidin, Researcher for Bioremediation at TNB Research.



Before (left): Water contaminated by transformer oil spillage at the Perai Power Station in Penang.
After: Clean water after the bioremediation process.