



CONSULTANCY SERVICE

FOR

**SealGreen - ReUse Concrete Sealing Specialists LLC.**

**Efficacy and Environmental Impact Study  
on  
Gray-Out & SG-APS**

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## **CLIENT**

SealGreen - ReUse Concrete Sealing Specialists LLC manufacturer of Gray-Out waterless concrete cleaner (“**Gray-Out**”) and SealGreen Asphalt Parking Space cleaner (“**SG-APS**”).

## **RESEARCH SUMMARY**

A research study was carried out on the effectiveness of Gray-Out and SG-APS in removing hydrocarbon petroleum matters such as oil, grease, gasoline, kerosene and other fluids and fuels from porous surfaces such as concrete and from non-porous surfaces such as asphalt. In addition to studying the efficacy of both Gray-Out and SG-APS in removing hydrocarbon petroleum matters, another focus of the study was made on their effect or impact, if any, on the natural environment.

Both products have been found to be effective in removing hydrocarbon petroleum matters. The result of our research study clearly demonstrates that samples of freshwater life and terrestrial insect remained unharmed after the application of both Gray-Out and SG-APS on them.

The result of our research further confirms that carbon dioxide is one of the major by-products of Gray-Out and SG-APS upon their contact with hydrocarbon petroleum matters. This means that hydrocarbon petroleum matters are converted into carbon dioxide and evaporated upon contact with both Gray-Out and SG-APS. This is a positive finding, because carbon dioxide is recognized as being unharmed to the natural environment.

## **RESEARCH OBJECTIVES**

1. To test the effectiveness of both Gray-Out and SG-APS in removing hydrocarbon petroleum matters from both porous and non-porous surfaces; and



2. To identify the harmful effect, if any, on the natural environment of both Gray-Out and SG-APS.

### **DESCRIPTION OF Gray-Out & SG-APS**

Based on the information provided to us by the Client our research has been carried out upon the following premises:

1. SG-APS, which consists of a mixture of natural bio-organics, constitutes and acts as the active cleaning agent. According to the manufacturer's Material Safety Data Sheet ("MSDS") SG-APS has a specific gravity of 0.08 - 0.2 (where H<sub>2</sub>O = 1) and is designed to mix with water for application as a cleaning agent on non-porous or slick finish surfaces such as asphalt and also as a cleaning "accelerator" on porous surfaces such as concrete; and
2. Gray-Out is a finely granulated dry compound having a specific gravity of 3.5 according to the manufacturer's MSDS. The active ingredient that acts as the cleaning agent in Gray-Out is SG-APS meaning that SG-APS is found or mixed in Gray-Out. Gray-Out is so fine and so heavy that it is designed to enter and remain in the porosity of the surfaces to be cleaned without the use of water as a carrier, catalyst or neutralizing agent whether before, during or after the cleaning process.

### **RESEARCH METHODOLOGY**

#### **A. CHEMICAL COMPOSITION OF Gray-Out & SG-APS**

According to the Standard Methods for the Examination of Water and Wastewater, American Public Health Association (1995), Washington, D.C. ("APHA 1995") the total nitrogen (TN) level, total phosphorus (TP) level, and metal levels of mercury (Hg), lead (Pb), arsenic (As) in the samples of SG-APS and Gray-Out submitted by the Client were studied by colorimetric or absorption spectrophotometric method after acid digestion.



## **B. OIL REMOVAL TEST**

SG-APS was dusted over several piece of porous tiles coated with petroleum-based engine lubricant waste oil and observed after 2 hours.

## **C. TOXICITY TEST ON AQUATIC AND TERRESTRIAL LIVES**

### **I. Zebra Fish Test**

To determine whether SG-APS and Gray-Out are or are not harmful to freshwater life, a toxicity test on zebra fish (*Danio rerio*) was carried out on both product samples. To this end, two sets of tests: Set I test and Set II test were carried out. In the Set I test, samples of Gray-Out were applied to zebra fish. In the Set II test, samples of SG-APS were applied to zebra fish. For each set of study, five pieces of 2 to 3 centimetres zebra fish (head to caudal length) were tested in aerated distilled water with standard additions of 20 to 500 mg/l of the cleaners. The behavior of the fish were observed and recorded after 1 hour, 6 hours and 24 hours. In order to test the consistency of our findings, we repeated each of the Set I test and the Set II test so that the same test was carried out three times.

### **II. Mealworm Test**

The purpose of the mealworm (*Tribolium spp.*) test is to determine whether SG-APS and Gray-Out are or are not harmful to insect life. Again, we carried out two sets of tests: Set I test and Set II test. In the Set I test, samples of Gray-Out were applied to the worm larvae. In the Set II test, samples of SG-APS were applied. For each set of toxicity test on worms, five pieces of worms having a length ranging from 1.5 to 2 centimetres were tested in oat mixed with a series of 1,000 to 50,000 mg/kg of Gray-Out and SG-APS. The responses of the worms were monitored for 24 hours. As before, in order to test the consistency of our findings, we repeated each of the Set I test and the Set II test so that the same test was carried out three times.



## **D. CARBON DIOXIDE DETERMINATION**

Petroleum to Gray-Out was mixed in the ratio of 1:3 (by weight) and the resulting carbon dioxide, the main by-product that resulted from this mixture, was measured by a carbon dioxide sensor at the interval of about one minute.

## **OUR RESEARCH FINDINGS**

### **A. Chemical Composition of Gray-Out & SG-APS**

The following chart illustrates the presence or absence and the levels of the relevant chemicals found in both Gray-Out and SG-APS, based on the APHA 1995 methodology.

	Gray-Out	SG-APS
TN (mg/g)	0.134	0.442
TP (mg/g)	0.271	3.537
Hg (mg/kg)	0.037	0.047
Pb (mg/kg)	0.0	0.089
As (mg/kg)	0.30	0.015

### **B. Result of Oil Removal Test**

It is found to our satisfaction that SG-APS was effective in removing oil within 2 hours leaving no sign of oil on the porous tile (Figures 1 & 2).



Fig. 1. SG-APS was applied on one side of a piece of tile.

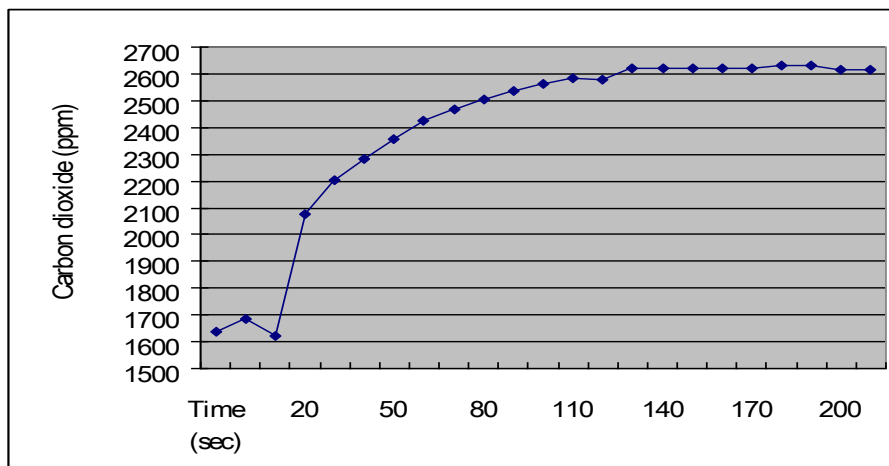


Fig. 2. The area dusted with SG-APS was rinsed after two hours and the petroleum engine oil was found to have disappeared.

### C. Result of Toxicity Test on Aquatic and Terrestrial Insect Lives

	Gray-Out:	SG-APS:
<i>Danio rerio</i> (zebra fish)	1-hour LC <sub>50</sub> : 450 ppm 24-hour LC <sub>50</sub> : 250 ppm	6-hour LC <sub>50</sub> : 240 ppm 24-hour LC <sub>50</sub> : 140 ppm
<i>Tribolium spp.</i> larva	24-hour LC <sub>50</sub> : 10,000 ppm	24-hour LC <sub>50</sub> : 50,00 ppm

### D. Carbon Dioxide Emission



## DISCUSSION ON RESEARCH FINDINGS

The result of our tests clearly demonstrates that both Gray-Out and SG-APS are effective in removing petroleum oil. It is very unlikely for Gray-Out and/or SG-APS to cause or create any hazard to aquatic life or terrestrial insects, except in the case where a deliberately high dose is applied. As the level of metal is found to be extremely low, it is our considered opinion that both products pose neither acute nor chronic toxicity to organisms through environmental contamination. The levels of nitrogen and phosphorus of both cleaners are also found to be on the low side and at levels similar to those of ordinary soils. For this reason, no eutrophication will be



caused as a consequence of the application of both products and the discharge or rinsing of the residue thereof to the environment.

Our test also shows that carbon dioxide has been discharged due to the reaction from mixing the oil with both cleaners. As complete mineralization of organic matter produces carbon dioxide, the increase in the level of carbon dioxide clearly demonstrates that both cleaners are capable of breaking down the hydrocarbon chain of petroleum-based oil by decomposing and dissolving the hydrocarbons with bio-organic compounds that actually consume the oil by mineralization. Normally, only biological enzymes such as those comprised in both cleaners are capable of converting hydrocarbon petroleum matters to carbon dioxide within a relatively short period of time. In fact, the two products under study are a great contrast to the conventional chemical degreasers which merely “lift” the oil by means of emulsification and move it from one place to another and then discharge to the sewerage that will eventually harm aquatic life if not properly treated in a scientific way.

## **CONCLUSION**

Both Gray-Out and SG-APS have been found to be effective in removing petroleum-based oil. They have very low toxicity to the aquatic life and insect samples being tested. The major end-product and by-product due to the reaction from the mixture of the cleaners with petroleum-based oil is carbon dioxide, which is biologically safe and environmentally friendly.