

Phytoremediation

The health implications associated with poor indoor air quality continue to place remediation techniques at the forefront of current industrial hygiene research. Due to the complex and variant nature of indoor air, multiple strategies must often be employed in order to achieve comprehensive pollutant reduction. Phytoremediation can often be incorporated as a low cost, eco-friendly, energy efficient tool for improving IAQ.

Phytoremediation is a natural process that can be generally described as the use of plants to reduce and/or eliminate pollutants from water, soil, and air. Although scientific debate continues over its applicability in industrial settings, recent research has promising implications for the use of plants to reduce VOC levels in office buildings and the home environment. Experimental results from numerous studies have shown that potted plants are capable of reducing normal to moderate levels of a wide variety of VOCs commonly found indoors by up to 75% within a matter of days. (1). Studies conducted in occupied offices reported reductions in absences due to sick leave as well as increased worker productivity. In addition, potted plants are able to regulate noise, temperature, humidity, and the flow of airborne particles. In addition to their aesthetic value, their versatility and availability allows them to be easily incorporated into nearly any indoor setting.

Plants utilize multiple processes to achieve VOC uptake and degradation. Compounds absorbed into leaves can be reduced to nutrients or structural features. Remediation also occurs below the soil surface. Here, a symbiotic relationship takes place between soil microbes and the root system. As nutrients are released from the roots, the microbial colony displays growth and enhanced activity. Because bacteria are capable of metabolizing almost any carbon-containing molecule into a nutrient source, VOCs included, a healthy colony of soil microbes can degrade VOCs effectively and rapidly, while in turn providing additional nutrients to the plant. Thus, it follows that nearly any species has the potential for self-regulating VOC reduction.

The numerous species and sizes available make potted plants a flexible option for indoor spaces with a variety of functionalities. Studies indicated that 3 small (table sized) pots were as effective as 1 large (floor size) pot. As VOC levels increased, the plants responded accordingly. In spaces 130-150ft², 3 large or 6 small plants were capable of reducing elevated VOC levels to < 100ppb. (1). Potted plants also pose little risk when compared to other methods of air quality remediation. For spaces where children or pets are a concern, there are several species of plant that thrive when hung with ceiling hangers or elevated stands, such as *C. Comosum* (Spider Plant), which proved highly effective at removing a variety of VOCs, including BTEX compounds, as well as formaldehyde. Other readily available species studied were *Spathiphyllum* (Peace Lily), *Dracaena deremensis* (Janet Craig), *Howea forsteriana* (Kentia Palm), *Epipremnum aureum* (Pothos, Devil's Ivy), and *Ficus Benjamina* (Ficus).

About Prism Analytical Technologies, Inc.

Prism Analytical Technologies, Inc. is a leading consultative air testing laboratory in the United States that is devoted to the chemical identification and analysis of contaminants in the air. We are a recognized leader in the development and deployment of ambient air testing methodologies for Fortune 100 and 500 companies, industrial hygienists, and environmental consultants. Prism's science-based technologies and wide range of air testing support help clients solve indoor air quality, process control, industrial, and environmental challenges.

It is noteworthy that like any air quality remediation tool, potted plants must be properly maintained for optimum results. Plants should be placed in locations according to their light requirements. Proper watering, potting soil rich in organic media, a regular feeding schedule, and periodic repotting are all crucial for effective VOC removal. However, when adequately cared for, potted plants offer an aesthetically pleasing, low cost solution for IAQ improvement in virtually any indoor environment.

The following resources provide additional information on houseplant selection and care:

Chicago Botanic Garden: Most Effective Plants for Treating Indoor Air Pollution

http://www.chicagobotanic.org/smartgardener/february11_nasa.php

National Gardening Association (Query: Container Gardening)

www.garden.org

1. Tarran, et al. (2007). "Use of Living Pot-Plants to Cleanse Indoor Air – Research Review". *Proceedings of Sixth International Conference on Indoor Air Quality*. III. (249-256).
2. Orwell, et al. (2006). "The Potted-Plant Microcosm Substantially Reduces Indoor Air VOC Pollution: II. Laboratory Study". *Water, Air and Soil Pollution*. **177**. (59-80).
3. Guieysse, et al. (2008). "Biological treatment of indoor air for VOC removal: Potential and challenges". *Biotechnology Advances*. **26**. (398-410).
4. Wolverton (1989). "Interior Landscape Plants for Indoor Air Pollution Abatement". *Nasa Final Report*

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