

# Utilization of Vetiver Grass as Construction Materials

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## 1 A KING'S INITIATIVE

The impact of rain water washing away topsoil and surface runoff results in massive loss of soil fertility and causes erosion. His Majesty, King Bhumibol Adulyadej, has long ago realized these problems and expressed his ideas about Vetiver, a grass with proven potentials in preventing erosion and conserving soil moisture. With His Majesty the King's deep interest in vetiver, the Royal Development Projects Board compiled related royal comments on the grass giving impetus to the Royal Project Foundation's on-going collaborations with the Asian Institute of Technology's School of Civil Engineering.

## 2 WHAT IS VETIVER?

Vetiver is the base component in the Vetiver Grass System (VGS), a very effective soil, water conservation, and land rehabilitation system. Vetiver is closely related to sugar cane and sorghum plants. For centuries, it has been used to produce essential oils, medicinal products and for thatching. Recent researches have shown that vetiver is effective, simple, inexpensive, demands low maintenance with valuable applications for erosion and sediment control, slope stabilization, and rehabilitation of toxic and contaminated lands. Being vegetative, the use of vetiver grass is environmentally-friendly.

## 3 VARIOUS USES

Vetiver possessed several alternative income-generating options. For instance, vetiver roots and leaves can replace natural materials or uses as mixing composite. Its roots can be industrially extracted for essential oil; its leaves are utilized for handicrafts and household decorative items. Its applications in the cosmetics industry and pest control are also currently explored. Moreover, vetiver clay composite can be utilized as a building material.

## 4 VETIVER AS CONSTRUCTION MATERIAL

The project's goal is to transform vetiver from simply being an agricultural material for soil conservation into an industrial, low-cost construction material. The ongoing researches at AIT starts with the exploration of the use of **vetiver grass ash** as cement replacement material, furthers

its utilization as **vetiver fiber-clay composite for construction**, and using **vetiver pulps as fiber reinforcement**.

#### **4.1 Use of Vetiver Grass Ash (VGA) as Cement Replacement Materials**

The properties of VGA were experimentally studied to consider the possibility of using VGA as a pozzolanic material. An experimental program was conducted to determine the physical and mechanical properties of VGA and cement mortar containing VGA. Moreover, its possible applications as VGA mortar are explored (Fig.1 &2).

**Figure 1. Burning Vetiver Grass by Ferrocement Incinerator**



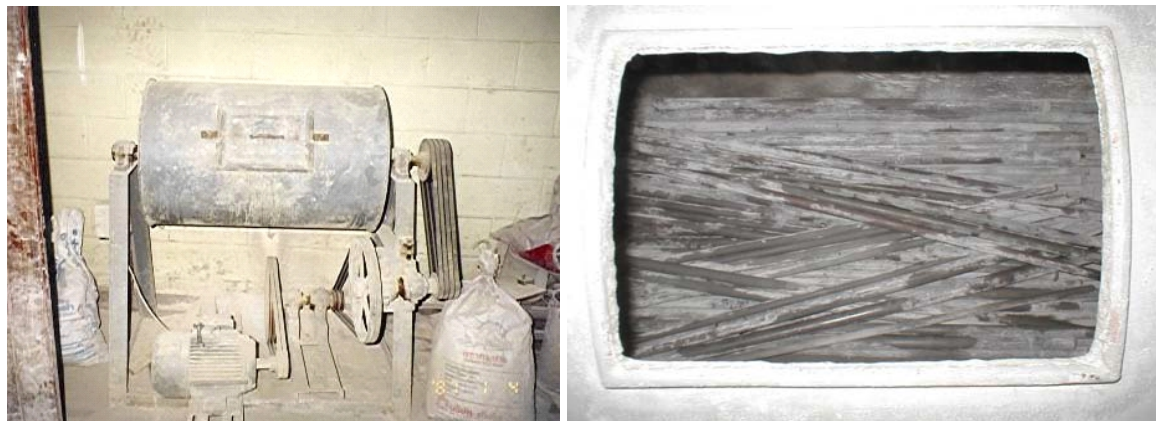
**Figure 2. Vetiver Grass Ash before Grinding**



## 4.2 Development of Vetiver Fiber-Clay Composite

Rice is one of the most important agricultural crops of Thailand. However, every season, farmers are pushed to sell their harvest immediately due to inadequate storage facilities. Research reveals that vetiver clay composite can be used to build storage silos. However, some factors affect the strength of the composite and these factors need to be considered in the construction and design of vetiver clay silos. For this purpose, the ongoing research looks into the use of vetiver stem and leaves as natural fiber (Fig.3).

Figure 3. Grinding Machine





#### 4.3 Development of Particle Boards from Vetiver Grass

This research investigates the physical and mechanical properties of vetiver grass as particleboards using suitable adhesives by utilizing locally available materials. Three different adhesives having different content were experimentally investigated to determine the optimum mix proportion (Fig.4, 5, 6 &7).

**Figure 4. Cutting 20 and 30 mm fiber length**



**Figure 5. Pressing by hands in order to check the uniformity of Vetiver Grass**



**Figure 6. Applied load by hydraulic jack**



**Figure 7. Vetiver Grass board**

