



SOIL STABILIZATION USING HYDRATED LIME & GEOSYNTHETIC AT PT. ASTRA HONDA MOTOR PQE FACILITIES



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OVERVIEW

As one of the divisions of PT. Astra Honda Motor (AHM), Product and Quality Engineering (PQE) is responsible to maintain and develop the quality of automotive products, especially for motorcycles, their core business.

PQE is built on an approximately 50 hectare of swampy area at Tipar Cakung, consisting of office buildings, which is connected to the motorcycle test course.

PT. Conbloc Infratecno was awarded to construct some of the facilities, such as the Access Road, the Inspection Road, and the 2nd Stage Test Course.

Those projects were quite challenging, especially because they sat on **VERY POOR SUBSOIL**.

EXISTING SOIL CONDITION

The existing poor soil condition was a challenge to Conbloc's engineers to find out the best possible solution to improve its characteristics. The existing soil mostly consists of **EXPANSIVE CLAY** which has very poor bearing capability ($\text{CBR} < 1\%$) and has **HIGH SWELLING POTENTIAL** ($\text{PI} > 20$).



Existing Condition of the Access Road



Existing Condition of the Inspection Road



Existing Condition of the 2nd Stage Test Course

PROJECTS WORK ITEMS

Description	Access Road	Inspection Road	2 nd Stage Test Course
Soil Stabilization	Limestone Sub-base	Soil Stabilization using Hydrated Lime	Geotextile
Road Structure	Modified CTB	Base Course	Lime stone & Base Course
Wearing Course	Asphalt Concrete	-	Asphalt Concrete & Chipseal
Others	Outdoor Lightning	-	Bridge & Paddock



Pavement Structure Strengthening using Modified Cement Treated Base

SOIL STABILIZATION

There are several methods to improve or stabilize poor subsoil:

First, mechanical compaction. This method concentrates on soil densification using compaction effort such as vibratory or pad-foot roller.

Second, using geosynthetic material. This method facilitates to improve the shear strength of material. This method was used to build the 2nd stage test course.



*Soil Stabilization using geosynthetic
2nd Stage Test Course*

Third, using chemical binder. There are various chemical products that can be used as soil stabilization agent, but the most common are cementitious materials and/or lime.

Lime stabilization mostly used to improve the clayey soil. Lime effectively used on the soil which has PI >10 and clay content (2μ) >10%.

INSPECTION ROAD STABILIZATION

Soil stabilization in the Inspection Road proposed by Conbloc's engineers as a design alternative to substitute the original design using piles and geosynthetic material which was difficult to do.

Existing soil stabilization using hydrated lime was expected could improve the soil characteristics so that the stabilized soil would meet the specifications for subgrade, therefore no imported soil was required to replace the existing soil.

The Working Sequences of Soil Stabilization

1. Dewatering and Land preparation

The existing soil water was drained out to reduce its moisture content. Temporary ditch was built using heavy equipment. The vegetation was scrapped to remove the organic materials.

2. Lime Spreading

3% by weight of hydrated lime was spread on top of existing soil.

3. Soil Stabilization using Recycler

Soil and the spread Hydrated Lime were mixed by Recycler/Stabilizer machine which was connected to a water tank to add sufficient water to allow the stabilized soil can be compacted well.

4. Curing Process

Stabilized soil was cured for 48 hours to prevent the chemical process undisturbed and the stabilization process to achieve the optimum performance.

5. Trimming & Compaction

After 48 hours, the stabilized soil can be trimmed and compacted. The road base was built over the stabilized soil.



Hydrated Lime spreading



Soil stabilization using Hydrated Lime connected to a Water Tank



Dewatering & Land Preparation



Trimming and Compaction

PERFORMANCE EVALUATION



Moisture Content Test Using Speedy Tester

Quality control tests conducted during and after construction, showing satisfactory results of the stabilized soil performance. Hydrated lime stabilization on this type of soil has resulted in higher bearing capacity (CBR) and lowered the swelling potential as well (PI).



Access Road – After one year of maintenance period

SOIL IMPROVEMENT/STABILIZATION ALTERNATIVES COMPARISON

Performance goals	METHOD OF SOIL IMPROVEMENT		
	Mechanical Compaction	Geosynthetic Application	Stabilized by Lime or Cement
Increasing Bearing capacity	Low	Medium	High
Decreasing Moisture Content	Medium	Low to High	High
Decreasing Swelling Potential	Not Available	Not Available	Medium

CONCLUSION:

Soil stabilization method by applying Hydrated Lime was successfully applied to improve **the existing poor and expansive subgrade soil** in the PT Astra Honda Motor POE Facilities's Inspection Road Project. The Lime Stabilization was successful technically and economically to replace the option to import suitable material/soil to replace the existing bad soil which would involve difficult logistic and working environment particularly when working in rainy season.