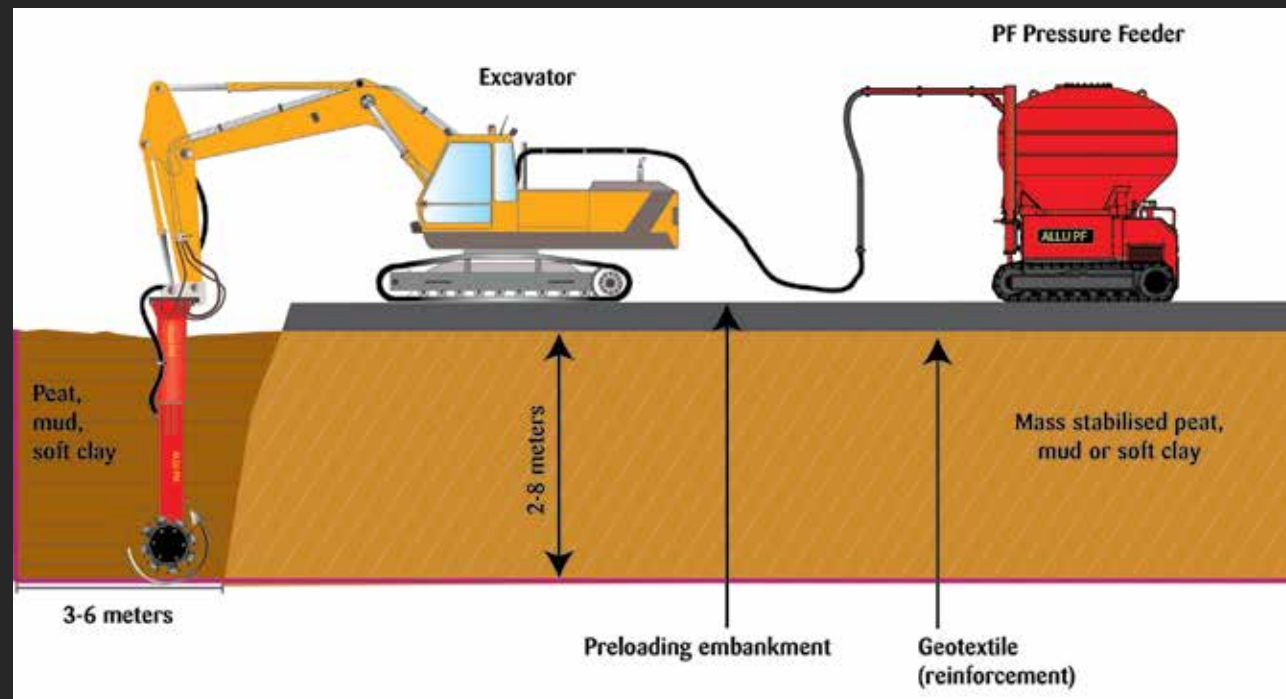




ALLU STABILISATION SYSTEM

SOIL STABILISATION METHOD



Mass stabilisation is a ground improvement method for soft soil layers. Stabilisation is done by mixing an appropriate amount of binder throughout the volume of the treated soil layer. The binder can consist of a single substance or be a mixture of various substances like cement, lime, fly ash or furnace slag.

Mass stabilisation method was developed in Finland in the early 1990's and in the development work the experiences from column stabilisation were utilized. The machinery designed and dedicated only for mass stabilisation was developed by ALLU in the early 2000's.

Mass Stabilisation is a versatile technology for civil engineering and environmental applications for:

- ▶ in-situ improving of soft soils
- ▶ remediation of contaminated soils
- ▶ improving and utilizing clean and contaminated soft sediments

Stabilisation is a geotechnical method to improve the bearing capacity and stability of ground. This is done by mixing binders into the subject soil. A similar technique is used in contaminated site remediation.

Stabilisation Method

Stabilisation is a geotechnical method to improve the bearing capacity and stability of marginal ground. Clay, peat, silt, sediment, sludge, or dredged material can be transformed into solid ground. The method relies on thoroughly mixing binders into subject material while the material remains in-place or insitu.

Stabilisation is quick and cost effective compared to other traditional methods such as: excavation of incompetent soil and replacement, or compaction by surcharge. The ALLU Stabilisation system allows you to treat and quickly access low bearing capacity ground for infrastructure development. The stabilisation method can also be used to remediate contaminated property. The technology immobilizes or destroys hazardous constituents to permit reuse or redevelopment of the property.

Benefits of stabilisation with ALLU equipment

- Fast ground improvement, stabilised ground can support advancing equipment and structures often within a day.
- Sustainability-Stabilisation facilitates reuse of existing on-site material
- No need to use off-site material as replacement fill, avoids excavation and transportation costs
- Conserves landfill space, unsuitable soil is treated, not disposed
- Lower carbon footprint than excavation, transportation and replacement
- Cost-effective use of binders, accurate binder dosing and thorough mixing
- Industrial by-products such as fly ash and slag may be used as binders



APPLICATIONS

Applications for Soil Stabilisation

Civil Engineering

- Stiffening of pavement subgrades
- Stabilisation of embankments
- Protection of adjacent structures from transmitted vibration
- Improvement of clay, silt, or peat soils
- Improve bearing capacity of soil for building foundations
- Modification of very soft soils for tunnel boring
- Cable/pipe channel construction sites
- Support of noise attenuation barriers
- Low permeability ground water protection layers
- Reduction of soil hydraulic conductivity
- Erosion control
- Protection layers for permafrost and frost

Processing or Mixing of different materials

- Recycling of the industrial by-products

Stabilisation of dredged sludge

- Reuse of dredged material management areas for infrastructure development
- Treatment of dredge within barges producing engineered fill

Treatment of waste or contaminated material

- Solidify free-liquids
- Increase compressive strength
- Insitu solidification/stabilisation (ISS)
- Immobilize hazardous constituents
- Insitu chemical oxidation or reduction (ISCO or ISCR)
- Reduction of hydraulic conductivity





ALLU STABILISATION PRODUCTS

ALLU PMX Power Mixer

The ALLU PMX Power Mixer is an attachment for a conventional excavator. The ALLU PMX is powered by the excavator's hydraulic system. Attaching the PMX converts the excavator to a powerful and versatile mixing tool. The mixing drums penetrate and mix a variety of material in place or insitu. Materials can be mixed anywhere the excavator can go, capitalizing on the excavator's mobility and articulation to reach difficult or soft areas. Binders or chemical agents are delivered to the area of the highest mixing shear by an attached 80-mm (3-inch) dia. pipe, injected via nozzle located between the mixing drums. The ALLU PMX is easily mounted on an excavator with pin mounts or with a quick hitch adapter plate.

Intelligent construction

The ALLU Power Mixer is able to effectively mix a variety of difficult materials including, clay, silt, peat, sludge, sediment, dredged material, and contaminated soil. The ALLU PMX penetrates through hard crust layers and mixes the soils effectively. Penetration and mixing effectiveness is enhanced by angled position of the drums that minimizes the "dead" area at the bottom frame.

Material processing to a depth up to 7 meters (23 feet)

ALLU Power Mixer can process materials to a depth of up to 7 meters (23 feet) depending on the PMX model extension, and the nature of the material.

Designed for durability

Made from wear-resistant steel, the ALLU PMX's stem is engineered to be strong, streamlined, and lightweight. This design lowers penetration resistance by the material subject to treatment and prevents any stress concentration within the stem. Hydraulic hoses are routed within the stem for protection. There are no service hatches at the lower part of the PMX and mixing drum seals are engineered for long life.

Individual hydraulic motors within each mixing drum are powered by the excavator hydraulic system. The final drives rotate the mixing drums directly through planetary gears. ALLU PMX is equipped with automatic torque adjustment valves between the two hydraulic motors. The excavator operator controls the rotational direction and rpm of the drums to adjust for the most effective mixing of the material encountered. Cabin-mounted display indicates mixing drum rpm, temperatures, and internal hydraulic leak detection.



ALLU PMX 300 HD

Working depth:	3 meters (10 feet)
Hydraulics: (required)	23-35 MPa (3,300 - 5,100 psi), 200 - 300 l/min (50 - 80 gpm) 160 kW (215 hp) max power
Weight:	2,095 kg (4,620 lb) + fabricated mount plate 400 kg (900 lb)
Base machine:	25-40 metric ton (55,000 - 88,000 lb)
Option:	2 m (7 ft) extension tube 770 kg (1,700 lb)

ALLU PMX 500 HD

Working depth:	5 meters (16 feet)
Hydraulics: (required)	23-35 MPa (3,300 - 5,100 psi), 200 - 300 l/min (50 - 80 gpm) 160 kW (215 hp) max power
Weight:	2,445 kg (5,390 lb) + fabricated mountplate 400 kg (900 lb)
Base machine:	25-40 metric ton (55,000 - 88,000 lb)
Option:	2 m (7 ft) extension tube 770 kg (1,700 lb)

ALLU STABILISATION PRODUCTS



ALLU PF 7 & PF 7+7 Pressure Feeders

The ALLU PF Pressure Feeders are self-contained pneumatic-based binder delivery systems. The ALLU PF's use an on-board air compressor to pressurize a tank of binder and deliver the binder in dry form to the operational mixing depths of the ALLU PMX or other mixing equipment. Delivering and mixing binder in dry form conserves the "drying" capacity of a binder. Dry mixing is a more cost-effective use of binders when wet soil or sediment is to be stabilized. The ALLU PFs are on a tracked chassis and are remotely controlled from within an excavator cabin allowing the operator to adjust for site and material conditions.

Engine:	74.5 kW (99 hp) diesel
Compressor:	
Working pressure	max 800 kPa (120 psi)
Output	6.5 m³ (230 ft³) / min
Tank:	
Maximum working pressure	800 kPa (120 psi)
Gross Volume	approx 7 m³ (250 ft³)/tank
Approx. weight of binder charge (based on portland cement)	7 metric ton (8 ton)/tank
Feeder:	
Feeding capacity, adjustable	up to 5 kg (11 lb) / sec
Feeding Distance	up to 75 m (250 ft) at 5 kg/sec
Weight (empty):	
PF 7	7,900 kg (17,500 lb)
PF 7+7	13,500 kg (29,800 lb)
Option:	
Bag filter for use while filling tank(s).	



ALLU DAC. (Data Acquisition Control) system measures, controls and reports the feeding operation of the ALLU PFs. The ALLU DAC. enables user friendly control of the dry powder feeding system. Data is recorded and can be transferred onto other computers. Feeding operation is properly documented for quality control purposes.



ALLU PF 7



ALLU PF 7+7



ALLU STABILISATION PRODUCTS



3D Positioning System

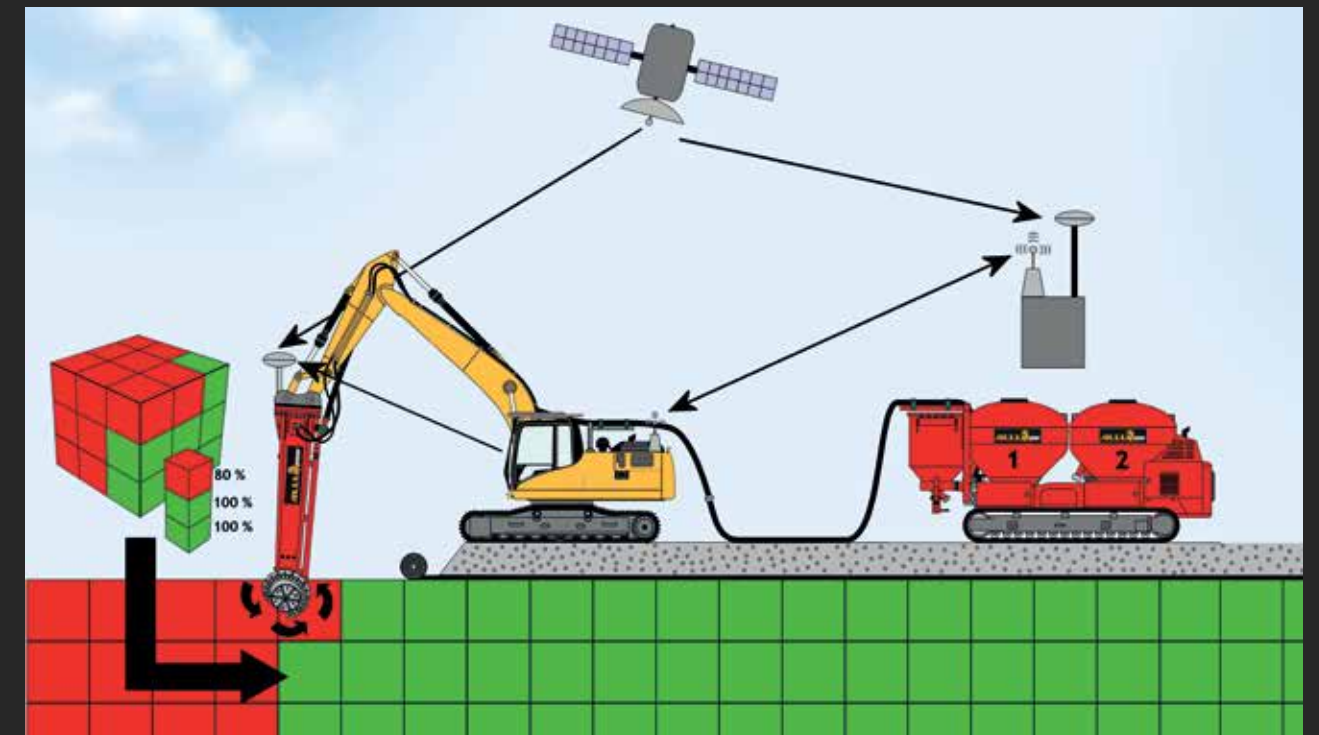
3D Positioning System is a GPS-based insitu mixing guidance and recording system.

- An option used with PMX power mixer and PF pressure feeders to guide excavator operator on mixing location, depth and binder dosing
- Generates reports on mixing location, depth, mixing time and binder addition rate for construction quality control and quality assurance (QC/QA)

The 3D positioning system informs the excavator driver the position of the mixing head at the accuracy of +/- 2 cm. The system consists of four modules: computer unit with ALLU software, touch screen, base station sending correction signal and GPS sensors.

The system guides the driver to feed right amount of binder and to mix adequately each cell of the block. It eases the mixing, ensures homogenous mixing results and accurate binder feeding for the entire block. The system has advanced data logging and reporting system.

The ALLU 3D Positioning System can be mounted on every ALLU Stabilisation System, new or old.



APPLICATIONS



Coastal Facility Examples

Expansion of ports and other industrial facilities near coastal areas often involve building new infrastructure onto former dredge material management areas or other areas of poor bearing capacity ground.

ALLU's soil stabilisation technology has been successfully used in Europe and North America to improve marginal coastal land. Increased production of natural gas in the U.S. has led to construction of new expansion of existing, liquefied natural gas (LNG) facilities around the Gulf of Mexico. In 2015, an LNG facility construction project in Louisiana began using ALLU Power Mixers and Pressure Feeder to improve the bearing capacity of clay/silt soil areas.

The treated areas quickly provide support for additional construction activities to build new tanks, roads, pipe racks, and liquefaction equipment.

Reuse of dredged material from harbours is often complicated not just by the low-bearing capacity of the material but also environmental contaminants within the material. This was the problem faced during the construction of the new Vuosaari Harbor Center near Helsinki, Finland. ALLU's equipment was used to create a 10-hectare (25-acre) container storage area by treating and reusing tributyltin (TBT)-impacted dredged material.



Rail and Transportation Examples

Soil stabilisation technology is often the answer for improvements to rail right-of-way. Heavier, more frequent freight trains, or high speed passenger service demand stiffer, higher bearing-capacity railroad subgrade.

ALLU's soil stabilisation technology has been used in new rail construction and to improve/repair existing rail. Soil stabilisation was used during construction of a new high-speed passenger service corridor in southern Finland. An area of unsuitable soft peaty soil was treated, creating a stiff competent subgrade that now supports smooth, precise rail alignment.

Soft areas in existing right-of-way can limit freight train weight and/or speeds. A 2014 project in Ontario demonstrated the use of ALLU soil stabilisation equipment to address areas of mud pumping between ties. Stabilisation was used to "spot treat" problem areas. The mobility of the excavator-mounted ALLU Power Mixer and self-contained Pressure Feeder facilitates use in remote areas.



Contaminated Site Remediation Examples

ALLU soil stabilisation equipment has been used for remediation of contaminated sites. Remediation technologies including Insitu Solidification/Stabilisation (ISS), Insitu Chemical Oxidation (ISCO) and Insitu Chemical Reduction (ISCR) involve mixing binder/reagents into contaminated media such as oil, sediment, or sludge.

ALLU Power Mixer's injection tube and nozzle deliver grouted or dry binders/reagents to the area of high mixing shear between the mixing drum. High mixing shear thoroughly mixes additives into contaminated media.

ALLU's Pressure Feeder can deliver dry binder/reagent conserving drying capacity or reactivity. ALLU soil stabilisation equipment has been used for decades in ISS projects treating contaminated soil, dredged material and sediment. In 2015, an ALLU Power Mixer was utilized at an ISCO project in Kenova, WV. The ALLU equipment mixed sodium persulfate and activator into petroleum-impacted soil.

ALLU - AT YOUR SERVICE!



Project planning

Our goal is to provide our customers comprehensive service. During almost twenty years in mass stabilisation business, we have built a strong relationship in the field with various operators.

In addition to the machinery, we offer our help and knowledge for carrying out “the whole package” including project and site planning.



Training and start-up/comissioning

Training and commissioning is part of our service package to our customers.

We tailor the training according to customer's unique needs. The focus in the training is on practical matters. After approximately one week training, one can operate ALLU Stabilisation System independently.



Spare parts and accesories

ALLU After Sales Team is committed to serve our clients fast and efficiently.

We provide a wide range of spare parts and wear parts straight out of the factory stock. Our aim is to minimize the downtime for our clients. By using original factory provided spare parts you ensure the effective operation of your ALLU machinery.



Product support

The support of ALLU Team doesn't end after delivery of the machinery and commissioning.

ALLU specialists are ready to help you with all questions and information you might need during your stabilisation projects and with service work concerning ALLU equipment.

ALLU, 30 years of experience at your service!



The ALLU attachments are designed to perform cost-effectively on demanding job sites and materials so you can work faster and improve profitability.

The ALLU attachments are known for their reliability and superior quality for already 30 years.

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