ALLU PM Power Mix – Make use of soft land

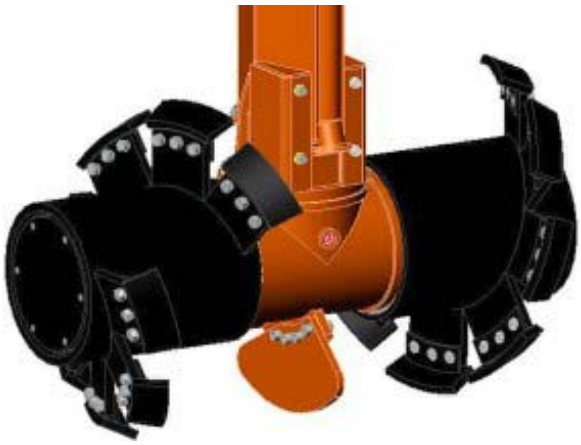
What is the ALLU PM Power Mix?

The ALLU PM Power Mix is a new and innovative product from Ideachip Oy in Finland. It makes it possible to add binder agent, in order to strengthen and solidify different kinds of soft materials very cost effectively, and therefore more profitably. The working method is called stabilisation, and it is believed in the near future the number of applications being operated will multiply all over the world. This increases business opportunities especially for contractors operating in the earthmoving sector.

The ALLU PM Power Mix is a versatile hydraulic accessory for excavators. It converts the excavator to a mobile and effective mixer unit. Soft areas can now be utilised and developed after they have been treated using the stabilisation method. The method is quick and cost effective compared to the traditional method where mass is exchanged. For example different kind of clayey, swamps, and muddy lands can be transformed into solid layers using the stabilisation method. The ALLU PM Power Mix can get onto the site even if the ground is a swamp where it is not possible to walk. The stabilisation method can also be used in treatment of contaminated lands.

The ALLU PM Power Mix exploits the hydraulic power given by the excavator in a high operating efficiency. The hydraulic radial piston motor, which has a strong starting and torsion movement, converts the hydraulic power into rotating kinetic energy. The kinetic energy is transferred to the rotation drums through axis and bevel gears that have diagonal teeth. The gears and bearings of the drums are totally encased. The seal is designed to operate in difficult and extreme conditions. Therefore the ALLU PM Power Mix is able to operate continually and reliably in extremely difficult conditions e.g. when mixing materials at the bottom of a lake or seabed, contaminated soils, or clay in its different forms. Included in the design of the ALLU PM Power Mix is its low maintenance requirement.

There are different kinds of drums available to the ALLU PM Power Mix depending on the field of use. Patented mixing drums are suitable for most of the cases and ensure a uniform mix.



Picture 1. ALLU PM Power Mix's mixing drums

All wear parts have been manufactured of wear-resistant steel and can be easily changed.

Peak drums are normally used in cases where the material to be stabilised contains big clods or frozen soil that requires crushing to assure the uniform mixing.

The ALLU PM Power Mix is manufactured with 2m and 3m long bodies with a working depth of up to 5 m depending on the base machine and material.

Technical values	**PM 200**	**PM 300**
ALLU PM Power Mix weight [kg]	1895	2360
Weight recommendation of the excavator [t]	25…30	27…40
Max hydraulic volume flow rate [l / min]	200	200
Max continual pressure [bar]	240	240
Power continual/temporary [kW]	80 / 120	80 /120
Max recommended working depth [mm]	1800	3000
Speed of rotation of drums [1/min]	100	100

ALLU PM Power Mix technical values

What does ALLU PM Power Mix do and where is it used?

The ALLU PM Power Mix, mixes, fluid, semi-solid, and solid materials. It has a particularly good mixing capacity based on the ingenious horizontal drum positioning and cutting worm. The drums transfer and mix materials simultaneously in three different directions.

The ALLU PM Power Mix, mixing methods, can be divided to two different methods:

1. Method to mix solid materials where mixing is done in layers as shown in picture 2.

Picture 2. Mixing in layers by ALLU PM Power Mix.

The ALLU PM Power Mix treats the material and the binding agent (spread on the material) almost as vertical slices. The treatment occurs beneath the surface to the desired mixing depth of the material. The process starts from the longest reach of the Power Mix and works towards the excavator. The Power Mix moves the material while mixing it towards the excavator and forms a mixed mass layer in front of the excavator. Binding agents are normally spread on the surface with the ALLU e.p.m.-container unit (see picture 3.)

Picture 3. ALLU e.p.m., binder agent spreading unit.

An alternative is to inject the binding agent below the surface directly into the path of the mixing drums with the ALLU PF, mobile pressure feeder. Compressed air injects the binding agent directly to the middle of the mixing drums by using a feeding pipe and funnel. Equipped with measuring, feeding and reporting equipment, it is mounted on its own tracked chassis and remote controlled. It is therefore possible for the ALLU PF unit to follow behind the lead excavator onto the site.

Picture 4. ALLU PF pressure feeder

2. The mixing method of fluid and semi-solid materials where mixing is done block by block. This method is suitable when working on very soft areas such as a swamp or peat bog as in the case at Kivikko in Finland. The treated area is normally divided to equal blocks (15-25 m2). The ALLU PM Power Mix mixes the binding agent into one block at a time and continues through the whole area. The working depth normally varies from 0.5 to 5 meters. After the treatment the filter fabric and the gravel layer are laid on the treated area forming a protective barrier. The process is then repeated on the next block. The progress of every block treated is documented in the computer's memory and includes the amount of binding agent and the duration of each section.

Take soft areas in use with the ALLU PM Power Mix

ALLU PM Power Mix can be used in a large number of jobs.

1. Soil reinforcement in road and earthwork projects
    - Foundations for industrial buildings and bridges
    - Yard, parking area, sport ground and storage construction sites
    - Protection of adjacent structures
    - Reduction of earth pressure
    - Stabilization of very soft soils for tunnel boring
    - Road, street and railway construction sites
    - Protection layers under water
    - Cable/pipe channel construction sites
    - Noise embankments
    - Ground water protection layers
    - Slopes of the rivers, lakes, roads, etc.
    - Erosion control
    - Protection layers for permafrost and frost
    - Construction of waste disposal sites

2. Handling of contaminated soil
    - Isolation of contaminated soils
    - Neutralization of toxic waste

3. Mixing of different materials
    - Recycling of industrial by products
    - Stabilisation of liquid waste, and crude oil

Projects utilising the ALLU PM Power Mix

Industrial and parking area in Kivikko, Finland

Kivikko is situated in the eastern side of Helsinki, the capital of Finland. The terrain consists of peat, clay and sludge layers. The size of the area is approximately 1 hectare and in its original state completely unsuitable for construction purposes. In this area two separate stabilisation tests were carried out, in the first area mass stabilisation only and in the second mass and pillar stabilisation.

In the first area mass stabilisation was applied to a depth of 3 meters (see picture 5 of the stabilisation in blocks in Kivikko-swamp). The result was a solid platform 3m deep that will serve as the foundations for a parking area.

Picture 5. Stabilization in Kivikko-swamp with ALLU PM Power Mix

The second area treated, using the pillar and mass stabilization method, will serve as a building area for industrial units. The required stability and carrying objectives were reached; the results provide a very good example of the possibilities that can be achieved with stabilisation.

Sport field in Luopioinen, Finland

In Finland, where temperatures vary between -40 and +35°C, many sport fields have problems with freeze and thaw. A sports field in Luopioinen, in the middle of Finland, is a perfect example of this problem. For this reason it was chosen as a pilot project. The organizer of the project was Pentti Lahtinen from SCC Viatec Oy SGT.

After laboratory tests, the fly ash from a paper mill's power plant, and the fibre clay from a local mill were added to the soil. During the laboratory research it was observed that a homogenous mix of the materials is particularly important. The ALLU PM Power Mix was chosen as the mixing device, its pulverizing and mixing capabilities provided excellent results. The fibre clay and fly ash were spread on the surface. The Power Mix pulverized and mixed the clods of clay, while at the same time blowing the binding agent from the compressed tank into the mass. The field was finished in September 2002. Now after the experience obtained from Luopionen other projects are being explored.

Picture 6. Mixing mass with ALLU PM Power Mix in a sport field in Luopioinen, Finland.

Recovered Crude Oil, Spain

After the Environmental disaster created by the accidental sinking of the Prestige Oil tanker of the Northern Spanish coast. Crude Oil recovered from the beaches in Northern Spain was transported to a special handling facility, where the material was stabilised using calcium oxide, so that it could then be placed in a special category landfill. This method allowed the rapid containment of very large amounts of hazardous material.

Picture 7. Mixing crude oil and calcium oxide with ALLU PM Power Mix, Spain.

Pre-Dredged marine sludge, Spain

The requirement was to stabilise marine dredgings. The untreated material had a consistency similar to toothpaste, with moisture content over 40%. Cement was used to strengthen the sludge in order to make it suitable for building on. During the initial trials 100m³/hr production was achieved, with a ratio of 4% binder agent to sludge. After 24 hours the ground was strong enough to take the weight of a 35T tracked excavator.

Picture 8. Stabilising marine sludge, Spain.

Picture 9. Stabilising marine sludge, Spain.