Power-Sprays

Modular Batching Plants for Glass Fibre Reinforced Concrete (GRC and GFRC)

Power-Sprays has been at the forefront of the development and design of GRC production machinery for over 40 years since the industry began in the 1970's. Our specialist GRC production technology is used in more than 100 countries.

As the demand for high quality GRC products has increased so has the need to automate the production processes. In the cases of sprayed GRC and casting Premix GRC, this is challenging due to the variety of shapes and sizes designed. Architectural GRC applications tend to be bespoke and there is little scope for automation beyond basic flat or curved shapes. Nevertheless, there is one important step in the GRC production process which can be automated to improve efficiency and quality control and that is the mixing.

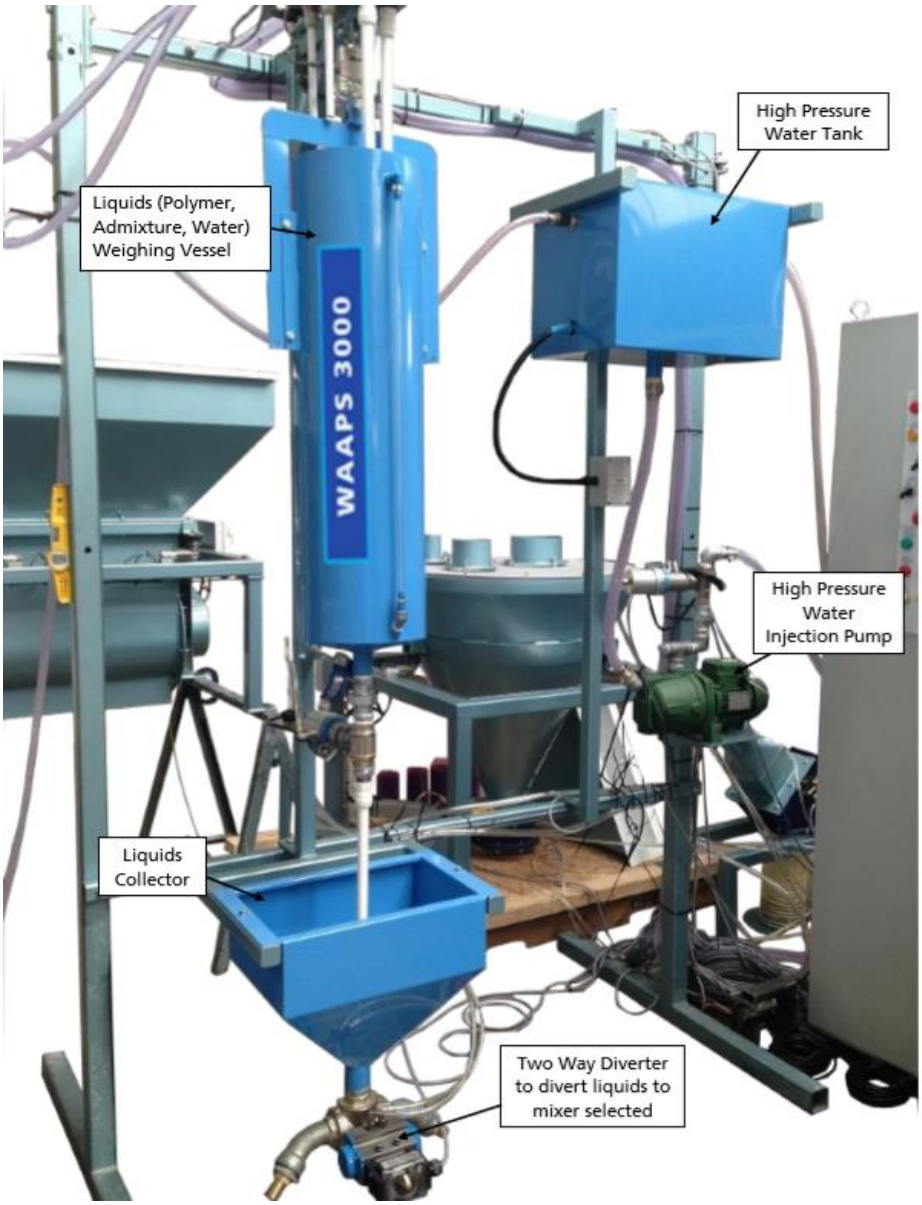
Power-Sprays has been building automated GRC batch mixing plants since the 1980's. Until recently, all have been individually designed and constructed to suit customer preferences. While this rarely presents technical problems, it has led to inefficiencies in terms of cost and after sales support. For these reasons, Power-Sprays has developed a range of modules from which individual batching plants can be configured and controlled by a fully supportable and expandable modular control system.

The modules are as follows:

1. Screw feed conveyors to convey dry sand and cement from bulk storage silos* or Bulk Bag dispensers or, in case of sand, steel hoppers.

2. Dry Materials Weigh Vessels –

3. Liquids Weighing Vessels – see annotated picture.

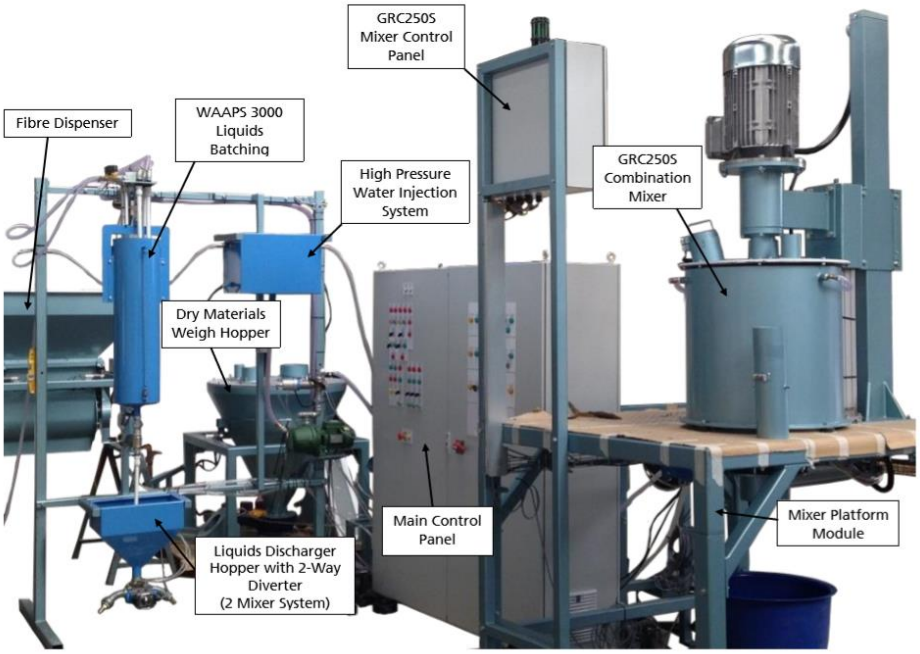


4. Chopped Glass Fibre Dispenser –

5. Multi Roving Glass Fibre Chopper -

6. GRC125S Combination Mixer –

7. GRC250S Combination Mixer –



8. Modular control systems –

1. **Screw Feed Conveyors** – for reasons of maintenance these are restricted to be less than 6m long (centre of inlet to centre of outlet) although longer conveyors can be constructed if necessary. The angles of inclination to the horizontal are important and must be considered in the final plant design.

   The silica sand used in GRC has a “flow back” angle of approximately 25 degrees. For this reason, sand conveyors are normally installed at angles shallower than 25 degs.

Cement conveyors can be operated at steeper angles and do not present such restrictions. Cement conveyors may be installed at angles greater than 30 degrees if necessary.

Power-Sprays control systems are designed for accurate weighing and utilise speed control systems to reduce the rate of material delivery as the target weight is reached.

Power-Sprays does not supply silos but can advise and help source these if required. Silo hardware including discharge control valves, safety systems and fill monitoring systems can be supplied. Our designs specify the silo outlets' 3D coordinates, outlet flange diameters and connection details to the conveyors.

Cement silos must be fitted with "cone breaker" systems and these are normally integrated with the Power-Sprays control systems.

Customers should also confirm that the storage of bulk sand and cement is feasible. In many countries sand is not available for delivery by bulk tanker and sometimes cement (often in the case of white cement) is not available via bulk tanker either.

If dry materials in "Bulk Bags" are available, this is an economic option for many factories. Power-sprays supplies the bag dispenser systems and can supply the empty Bulk Bags for the dry materials suppliers to use. Please note that there are several types of "Bulk Bag" available. Pleased consult Power-Sprays when choosing this option.

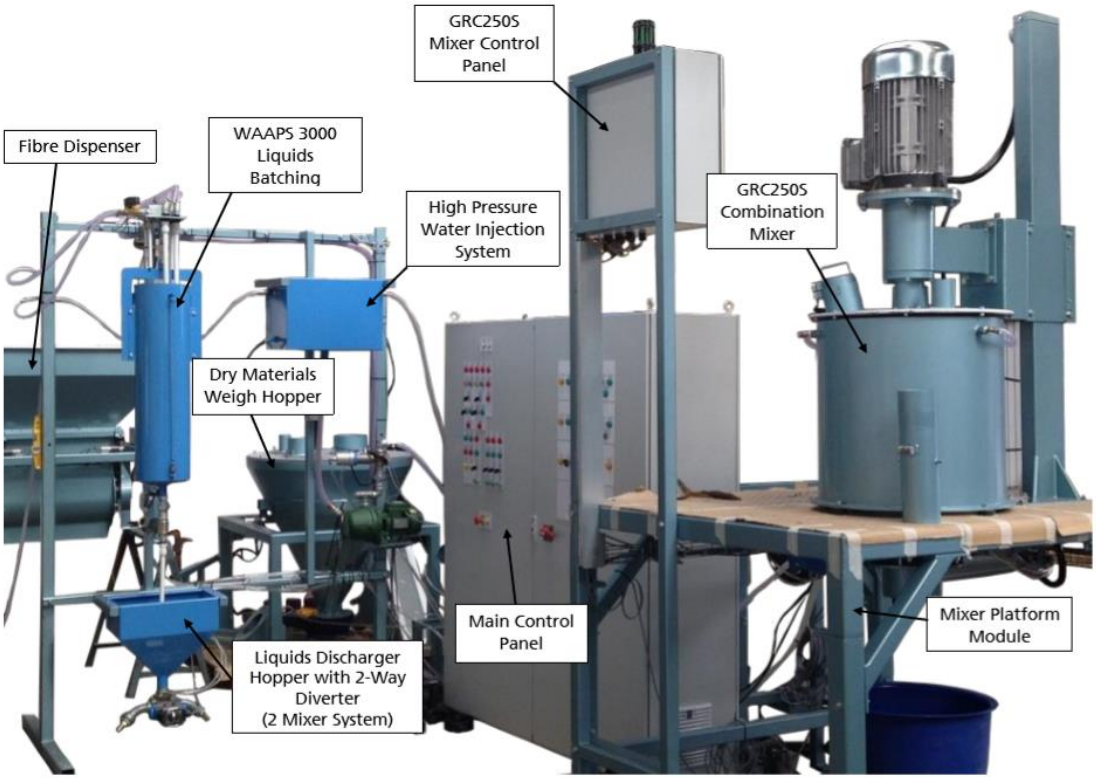
Where the addition of special sands is required (e.g. for face coat mixes), Power-Sprays offers bespoke hoppers to suit the plant layout

2. **Dry Materials Weighing Vessel** – the dry material weighing vessel is supplied as a complete module mounted on shock-absorbing load cells, to isolate from external vibrations for improved accuracy, within its own steel sub-frame. The dimensions and positions of the vessels inlets are coordinated with the outlets from the dry materials screw conveyors and discharge is via a pneumatically operated slide valve with vibrator assistance. When the system is required to supply two mixers installed side-by-side, a pneumatically controlled 2-way diverter is integrated below the vessel's discharge valve.



3. **Liquids Weighing Vessel** – as with the dry materials weighing module the liquids weighing system is supplied as a complete module within its own supporting structure. The system is designed to weigh water, admixtures (two are standard but more can be added) and acrylic polymer. Tri-lobe peristaltic pumps are incorporated to deliver the different admixtures and polymer. Water is normally delivered under mains pressure to the weigh vessel.

When selecting GRC125S or GRC250S Combination mixers a “high pressure” mix water injection system is recommended which is controlled through an electronic digital water meter. This assists maintaining the mixer in a clean condition by utilising the mixing water to wash the inside wall.



4. **Chopped Fibre Dispenser or Multi-Roving Glass Fibre Chopper** – these modules are designed for incorporation into batching plants where Premix GRC is to be manufactured instead of or in addition to slurry for sprayed GRC.
   Both systems control the quantity of fibre by weight. The chopped fibre dispenser is designed to accurately dispense fibres up to 19mm long (special units can be built for longer fibres). The multi-roving glass fibre chopper cuts fibre direct from roving’s. Up to 5 roving can be cut simultaneously.

   Please note that where two mixers are installed to produce Premix GRC, each mixer requires its own chopped fibre dispenser or multi-roving chopper.

5. **GRC Combination Mixers** – the GRC125, GRC125S and GRC250S mixer modules are all available for incorporation into GRC batching plants. The GRC125 Combination mixers are designed to be floor mounted (see picture 15) whereas the GRC125S and GRC250S mixers are supplied on raised structures ready for incorporation into mezzanine production platforms.

GRC250S Combination Mixer

Twin GRC125 Combination Mixers

GRC125S Combination Mixer Module

6. **Control Systems** – all plant modules are controlled via an integrated modular control system. The weights of all materials, dry sand and cement, water, polymer, admixtures and fibres are controlled automatically from recipes which can be stored in the system's memory. Individual recipes can be assigned names according to projects, spray teams etc. as required. Materials inventory control is also incorporated and daily/weekly consumptions of each material can be accesses as required.

   All plants require a full-time operator whose responsibilities include selecting the mix recipe, starting the weighing process, controlling the mixer speeds, activating the discharge

sequences of the liquids and dry materials, and adding fibres when producing Premix GRC. Finally, discharging the mix or removing the mixing vessel (in the case of floor standing GRC125 combination mixers).

Full automation of the weighing/discharge/mixing sequence and final discharge is feasible but not recommended. Due to the high cement content of GRC and the need to carefully monitor and control the fluidity of mixes Power-Sprays philosophy is to remove human error regarding control of weighing but to take advantage of human interaction when assessing mix workability prior to final discharge or adding fibres in the case of Premix GRC.

The Power-Sprays range of options

Power-Sprays "modular" GRC batch mixing systems can be configured to meet customer requirements in terms of plant outputs, mixes (Spray or Premix) etc. Plants can be configured around one or two mixers, floor standing or platform mounted, for Premix GRC or Spray GRC or both.

To reduce costs, plants can be supplied as individual modules for customers to integrate into steel supporting structures manufactured locally to Power-Sprays designs. Alternatively, Power-Sprays can offer a complete turn-key service. In both cases, Power-Sprays experienced GRC plant technician will supervise the installation, commission the plant and train the customer's personnel in operation and maintenance.

When requesting an offer please provide the following information:

1. Number of different dry materials and brief descriptions (if not normal GRC sand and cement).
2. Whether dry materials will be supplied via bulk tankers or other types of transport.
3. Whether silos are to be installed or bulk bag/hoppers are preferred.
4. The number and type of liquid admixtures, polymers etc. plus water.
5. Is a water chiller system required (recommended in hot climates).
6. Capacity of mixer(s) – daily output required.
7. Number of mixers – one or two, slurry for spray only or Premix GRC or both.
8. Floor or platform mounted mixers.

Please note that the GRC250S Combination mixer is recommended for producing large batches of "Self Compacting" Premix GRC but not normally for Sprayed GRC. The GRC125S can produce up to approximately 150 kg of slurry for sprayed GRC in 3-4 minutes and can be used to supply multiple spray machines. Due to the short workability time of GRC mixes we recommend rapid production of small batches so mixes are "fresh" when used. In particular, this applies to GRC factories operating in high ambient temperatures.

A further factor is factory layout and the distance from the batch mixer to the furthest spray stations. Where multiple spray stations are supplied and some are located over 50m (as a guide) from the batching plant consideration should be given to centralised weighing of dry materials supplying mixing stations located near the points of use of the mixes each equipped with their own liquids batching system. Again, this consideration is particularly relevant in hot countries where mixes can start to set before they are used. Please contact us for further details.