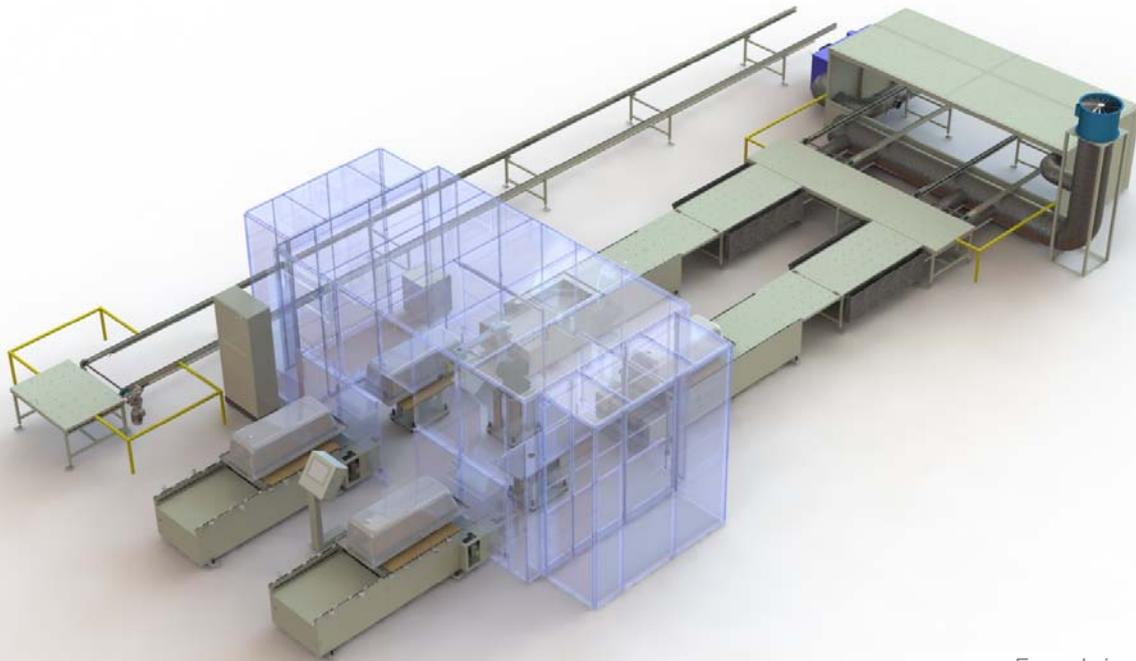
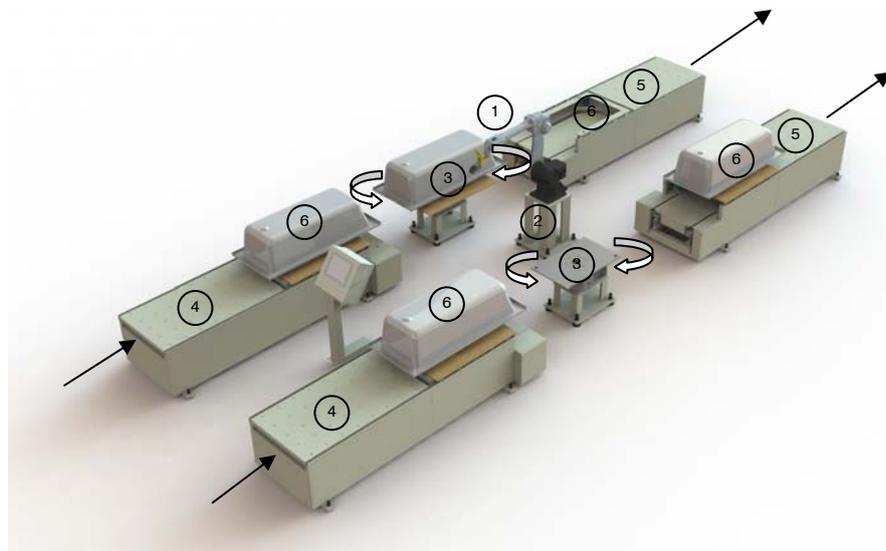


RS-02 ROBO-SPRAY



Example image only

The RS-02 Robo-Spray robotic spraying system is designed for flexible manufacturing that can run for 24 hours per day. The robot achieves maximum utilization due to careful integration with the supporting equipment. The Armour control system enables use by unskilled Operatives, and all programming can be carried out off line.



1. Robot
2. Robot Stand
3. Harmonised manipulator
4. Loading conveyor
5. Unloading conveyor
6. Product support

Products loaded onto the conveyors (4) are taken into the enclosure (not shown for clarity). The conveyors deposit the products onto the rotating manipulators (3) that are harmonised with the operation of the robot (1). When spraying is complete the unloading conveyors (5) lift the products from the manipulators and remove them from the enclosure. Products are located onto simple support structures. Part of the structure is illustrated above (6).

ROBO-SPRAY OPERATIONAL BENEFITS

Although Robo-Spray is capable of handling high volumes, it is the flexibility that is the key factor, as we have developed the system to handle a very diverse product mix with short runs (often only one part of each type).

The general principal of our standard commercial system is very similar to the set-up that can be seen in our factory (and on our CD ROM), but with many improvements. The benefits of our system over the others that we have examined are many, but the main design criterion is the flexibility. We are sure that we have developed the robotic spraying of GRP far beyond the systems of any of our competitors.

Development process:

The Armour Engineering Robo-Spray system has been very carefully developed over a period of several years, to ensure that it is the most suitable system available.

Using our own considerable experience of acrylic sanitary ware production, we studied the criteria required, and the robotic solutions that had been employed by other companies in order to be sure that every aspect was fully considered. When the investigation was complete and the results analysed, we were in a position to begin the mechanical engineering.

The prototype system was assembled in our bath factory in Sunderland and the basic principles tested and refined. Production was gradually transferred onto the robot and it was run in this environment for a period of 24 months to be certain of reliability and performance.

System parameters:

Total Flexibility:

The system is designed to offer complete flexibility for all product types without the need for long production runs. Once the programs have been created, the system can smoothly change from one product type to another, to another, to another and so on. A version of the standard Armour product support system is used for simplicity. This is very important as it ensures that the system does not restrict production in any way, and ensures ease of handling, simple consolidation and efficient curing. Programming is carried out off-line, so down time is minimised, and once the program is perfected it can then be saved permanently. Programs can be modified and re-saved, so one program can become the basis for many more, so saving time.

Superior Performance:

The system is designed to carry out the work of 1.5 men (depositing 6kg of material per minute), on three shifts, with minimal operator involvement and extremely low maintenance. Speed and accuracy are paramount.

Cost Savings - Materials:

The accuracy of Robo-Spray provides an immediate and obvious saving by significantly reducing over-spray. The reduction will vary, depending upon the skill level of the operators that it replaces, but in every case a reduction of at least 5% - 7% should be experienced. Additional savings can be achieved because it is possible to reduce the amount of material applied to certain parts. For example, if a particular product has a target reinforcement specification of 16kg when laminated manually, it may be possible to reduce this weight because the accuracy of the robot ensures that the laminate can be applied exactly where required, to the exact thickness required, every time.

Cost Savings – Labour:

As 1.5 men are replaced by Robo-Spray a direct saving can be easily identified. If use of the system is maximised by multiple shift operation, up to 4.5 men can be saved, giving a short payback period on the capital investment.

Improved Product Quality:

The finished quality of the product is enhanced considerably, as the amount (by weight) and the thickness of the laminate will always be completely consistent from product to product, once the specification has been established. For example, if you make a 1000 x 700mm product, and wish to apply 9kg of total reinforcement to it according to a program that you have created for the Robo-Spray, the result will always be exactly the same: A product that matches the program perfectly, every time.

Low Capital Cost:

Throughout the entire development process Armour ensured that the capital cost would be so low that production companies of all sizes would be able to make a case for installing the system in their factories.

Environmental Benefits:

Styrene gas emission in the spraying area is reduced because the distance between the spray gun and the product is always absolutely correct. Styrene is therefore maintained within the spray fan and then on to the product, so that it can be extracted safely during the curing process.

Training:

Armour provides full training for the Robo-Spray system at our factory in England. The clients' operators will be shown how to create, modify and store product programs, best practice, and maintenance. The standard training package is expected to be sufficient in most cases, but supplementary training is available on request.

Production Reporting:

Every operation that is carried out by the Robo-Spray system is recorded in the production log by time and date. The name/number of the operator, the start time, the break periods, the types and number of products sprayed, the weight of raw materials applied to each product and the time taken to spray each product are all recorded and can be printed or downloaded whenever required.

Production Scheduling:

The control system allows for a complete working shift of products to be entered in advance (in any order) and the robot will spray each of them in turn. A bar code reader can be incorporated if required, or the list of products can be transmitted directly from the office.

Monitoring Of Raw Materials:

The system is supplied with an integrated pair of weigh scales that monitor the reduction in weight of the resin and glass fibre, as the robot sprays. This ensures that if the glass fibre strands break, the weight stops reducing and the control system pauses the robot and gives an audio-visual alarm. The operator can then repair the break in the glass fibre and production can resume. The system can also be set to alarm for low resin or glass weights.

General Operation:

At the start of the days production the full list of products to be sprayed on that working shift can be compiled (or entered individually throughout the day). The first product is placed upon the number 1 conveyor and the operator presses the start button. The conveyor carries the product to the rotating table that is harmonised to turn in conjunction with the action of the robot. The conveyor deposits the product on the table and the robot begins its spray cycle. The next product on the list (which can be any type) can now be placed upon the second conveyor and it will be taken to the second rotating product table. When the point in the program is reached at which any additional reinforcement is required (wooden sections or steel pieces etc.) the robot switches to the second product and begins to spray that part in accordance with the program. The first product is brought back off the rotating table by the conveyor, so that the reinforcing parts can be applied by the operator (safely outside of the working area of the robot), and it is then taken back onto the rotating table. When the second products' reinforcing sections are required, the robot will return to the first product and complete the program there. The second product is carried out of the working area by the conveyor so that the sections can be applied and then it returns to wait to have its program completed as soon as the robot has finished spraying the first product. If no reinforcement pieces are required then the program will run to conclusion before the work on the second product begins. When the first product is completed the conveyor takes it off the table, out the other side of the working area and deposits it onto a gravity roller conveyor so that it can reach the consolidation area. In this way the robot is fully utilised and loading and unloading do not interfere with the cycle times.

Conclusion:

We firmly believe that the Armour 'Robo-Spray' system is the most efficient available and represents a logical progression in the modernisation of the GRP industry. The benefits are manifold and can be readily quantified to demonstrate the improvements in any given production environment.

MACHINE SPECIFICATION

ELEMENT	SPECIFICATION	
Machine Capabilities	Maximum product size:	2000 x 2000 x 600mm
Robot	Robot type: Repeatability: Maximum speed	Typically Panasonic Panarobo VR-006L ±0.15mm or less 2m/sec
Ancillary Construction	Main frames: Paint finish:	Rolled steel sections – BS EN 10025 material Textured powder coating
Spraying Head	Spray Gun: Deposition rate:	Magnum-Venus internal mix chopper gun 5.5kg per minute
Product Rotator	Harmonised manipulator	
Product Holding	Standard product support system with location dowels	
Control System	Armour PLC based system with touch screen operator interface	
Material Monitoring	Armour system with sensors and material alarms.	
Extraction	Specified and supplied separately.	
Enclosure	Modular unit with interlocked sliding doors.	
Electricity	3 Phase supply + Neutral + Earth: Maximum power consumption:	380/415V @ 50Hz 10 kW

example specification only - specification may be subject to change without notice

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