



Advanced
Automation
Systems



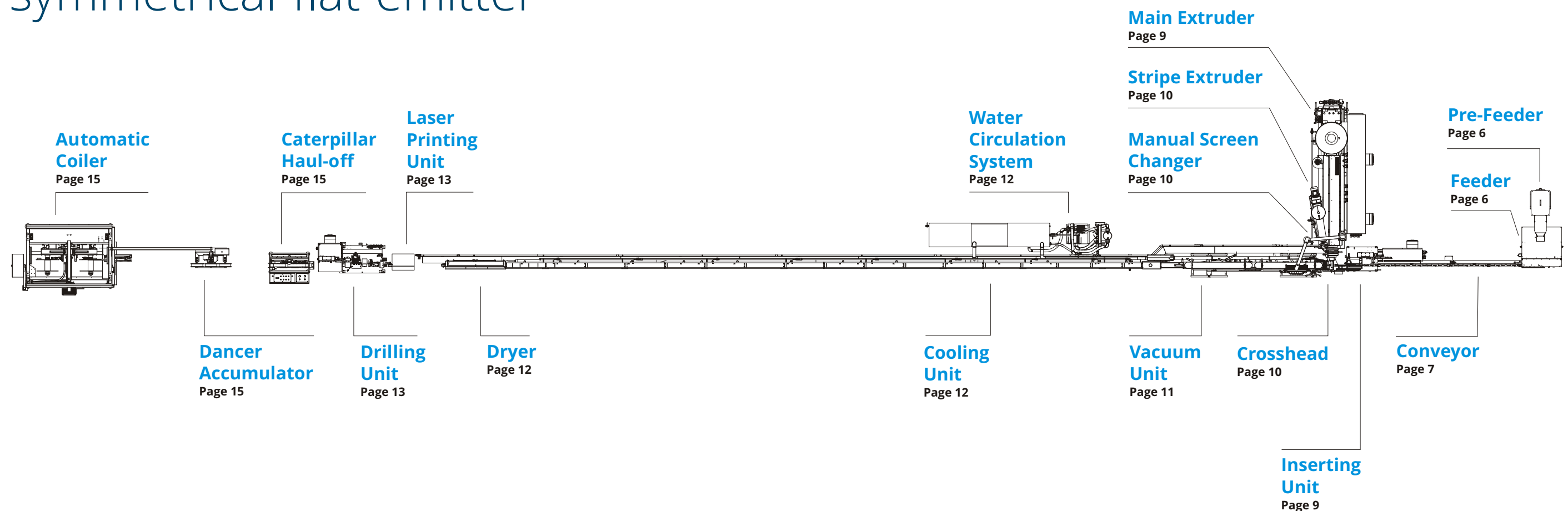
S180 FL

Drip Irrigation
Production Line
For Flat Dripline

S180 FL

is a cost effective and versatile drip irrigation production line, capable of utilizing every symmetrical flat emitter

Our knowledge, experience and expertise are combined with state-of-the-art technology and offered through S180 FL to our partners. From the design and development stage of every single component which is performed in-house from our R&D department, to the final commissioning of the production line at our partner's premises, we offer a unique quality experience. By bringing together the highest quality material made in Germany, with the latest technologies available, we manage to offer a comprehensive drip irrigation production solution attaining the industry leading production efficiency.



Total production line length:
Basic Composition 39,2 meters

S180 FL

Production Speed

Up to
180
meters/min

Inserting Capacity

Up to
600
emitters/min

Emitter spacing

Minimum
100
mm

Production Efficiency

Up to
99%

Minimum wall thickness

From
6
mil

Maximum wall thickness

Up to
36
mil

Pipe diameter

From
12
mm

Up to
35
mm

Emitters*

AAV Turbo®

AAV Cyclone PC®

Benefits of S180 FL

The unique attention to every single detail of our production lines along with the quality excellence that we offer, provide many benefits to our partners, which all translate to increased Return On Investment (ROI).



Industry leading production efficiency



Industry leading production speed



Fully customizable



The highest return on investment



Remote connectivity for data analysis, software updates and troubleshooting



Continuous upgrades in software and hardware



Ease of overall usage and settings



Industry 4.0



Enhanced Human Machine Interface (HMI) capabilities



Production of cylindrical dripline with flat emitters

Reduced

Downtimes
Malfunctions
Production shutdowns
Maintenance costs
Overall scrap
Energy consumption
Water usage
Vibrations
Noise
Factory floor space usage
Time between product change
Time for settings and adjustments

Increased

Overall production
Efficiency
Effectiveness
Productivity
Overall capacity
Quality of the final product

* Turbo and Cyclone PC equivalent emitters can be used with S180 FL production line. Depending on the size and weight of the emitter, production speed and inserting capacity may vary.

S180 FL Components

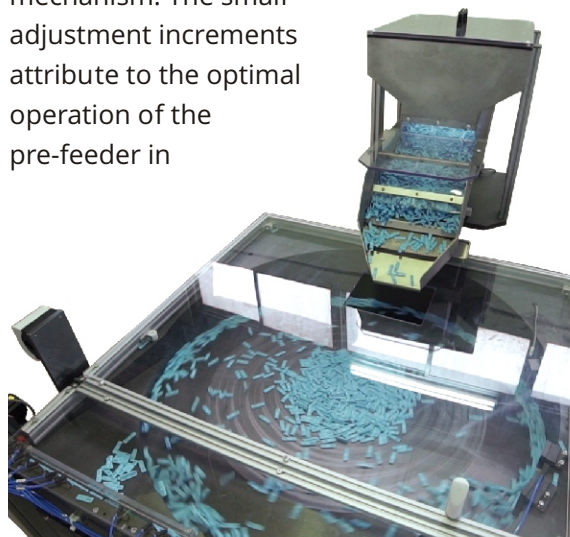
All parts of our production lines are designed by our R&D team and produced by carefully selected suppliers according to proprietary mechanical designs.

Emitter Feeder Unit

Production lines that operate at high speeds like the S180 FL, need a steady and uninterrupted supply of emitters in order to ensure that there will not be a production shutdown due to lack of emitters. Therefore, the feeder unit is a very important component of the S180 FL production line. In order for our S180 FL production line to operate at the industry leading speed for the particular segment, of 180 meters per minute, there is a need for supplying at least 600 emitters per minute. Feeding this quantity into the inserting unit without interruptions, faults and malfunctions is not an easy task and requires the combination of a pre-feeder and a feeder for an optimum, efficient and effective operation.

Pre-Feeder

The pre-feeder unit ensures the continuous supply of emitters into the feeder by utilizing a fully adjustable vibration mechanism. The small adjustment increments attribute to the optimal operation of the pre-feeder in



conjunction with the feeder and make the overall operation of the emitter feeder unit, far more efficient. The vibration mechanism that it incorporates, eliminates the possibility of any damage on the emitters.

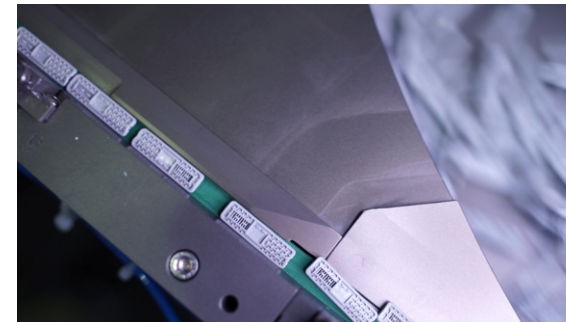
The software controlling the operation of the pre-feeder along with the interconnectivity with the feeder, ensures that the optimum number of emitters is always inside the feeder by providing a steady feeding stream.

The design and mechanism of the pre-feeder, filters small particles which may be stored with the emitters during the packaging process or from storing in dusty areas. This ensures that there will be no particle insertion into the feeder which can stop the production procedure.

The main material used for the construction of our pre-feeder is stainless-steel, selected for uncompromised operation. Moreover, all materials used are of the highest possible quality in terms of durability, performance and compatibility with the rest of the production line in order to ensure seamless operation under all production circumstances and climatic conditions.

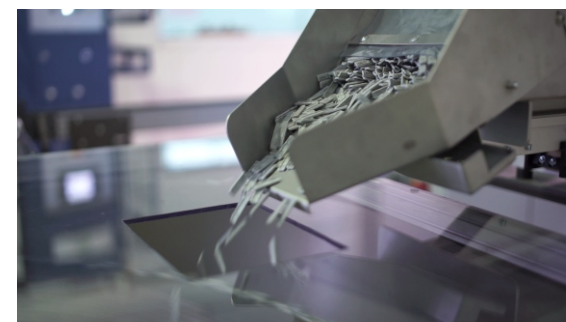
Feeder

The steady and problem free emitter supply of our feeders is a key element of their design. Especially for a production line that runs at 180 meters per minute (m/min) and requires a total capacity of 600 emitters per minute (e/min). The high capacity of our feeder, provides the overall desired quantity. Flat emitters need to be placed with their outlet chamber facing upwards before



entering the inserting unit, in order to be in the correct position for the drilling machine to make the hole or cut in the right spot.

The build quality of the centrifugal feeders is extremely important since they handle an enormous amount of emitters during their lifecycle. Our feeders are manufactured with extremely precise machinery and the highest possible quality materials, selected for the particular operation. Special chemical treatment of all the aluminum parts, ensure a life-time and trouble-free operation.



Our feeders are designed and manufactured by keeping in mind another important aspect related to the production floor, which is the overall space occupancy of the production line. Being able to achieve top performance and durability by keeping the feeder as small as possible is challenging yet achievable with the correct design.

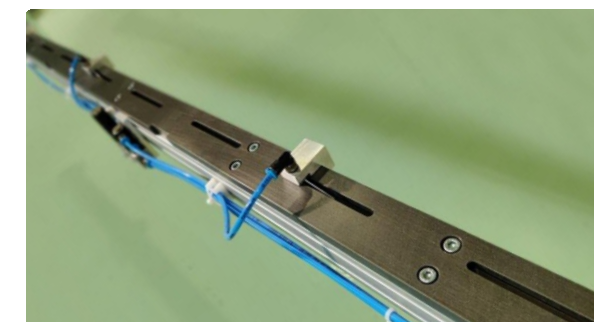
The use of a centrifugal feeding system in combination with extremely low manufacturing tolerances of the parts, results in a non-damaging feeding and insertion process of the emitters.

The feeder carries individual alarm signaling, with both visual and acoustic functions for distant alarm acknowledge. The alarm can be set for several different parameters including lack of emitters, emitter jam, a subsystem malfunction etc. All individual alarms of the feeder unit can be set and accessed through the main control panel.

The feeder incorporates a fully automated self-cleaning mechanism for the unlikely event of emitter jamming. The entire process is a combination of a specially developed software, along with the mechanical design and characteristics of the feeder. This combination ensures the perfect balance between the pre-feeder and the inserting unit. The feeder acts as a balance connection point of the overall feeding unit, between the emitter storage which is the pre-feeder and emitter destination, the inserting unit.

Conveyor

Our unique conveyor design enables the perfect transfer of the emitters from the feeder unit to the inserting unit. The emitters in our S180 FL production line are distributed with the use of air supply. The emitters after the feeder are inserted in a conveyor which with the help of air are transferred to the inserting unit. The passageway of the emitters towards the inserting unit is an internal smooth plate that prevents friction and damage to the emitters, providing a consistent rate for the inserting unit.



An advanced alarm sensing system is developed, to guarantee high quality end-product under the strictest industry's specifications and seamless operation of the module in the unlikely event of a malfunction during the feeding process.

All critical parts are manufactured under strict tolerances, from a special aluminum alloy to secure no damage on the emitters during the transfer process.

Moreover, a special chemical treatment of all aluminum parts, guarantees a life-time operation without compromising the production speed and performance.



Human-Machine Interface (HMI)

The main idea behind the design of our user interface, is to make it as easy to use and understand as possible, while controlling 100% of the production line functions from all access points. Moreover, training of new production line operators is quick and easy due to the design of our interface which is straightforward for every operator, regardless of their production knowledge and requires the minimum settings to produce high-quality dripline.

Hence, the interaction with the machine is user-friendly and the navigation of the parameters is optimized according to the real production needs. The same principle has been followed for the mechanical adjustments of the line. We reinvented,

designed and developed every small detail of each component of the production line in order to make it as efficient and effective it can possibly be.

Our HMI is fully customizable and adjustable in order to best fit the production needs and capabilities of our partners. The evaluation metrics of the production line can be set according to user's preference. This allows for a custom fit of the line's operation to each dripline manufacturer, according to their standards.

The HMI provides detailed statistics, data and graphs of the production line operation, along with a complete set of the production output data. Those functions transform the HMI to a powerful decision-making tool for production planning, cost analyzing, efficiency and effectiveness increasing and so on. Moreover, it is a user-friendly ad hoc monitoring of the production.

The industry 4.0 connectivity that our production lines incorporate, allows for remote line monitoring. This means that you can review and evaluate every production aspect remotely, without having to get in contact with the production line or visit the production floor.

IoT capabilities of our production lines ensure that the infrastructure follows the most up to date technologies. The advantages of useful insights are countless and result in production data that can be used for continuous improvements in dripline production and therefore increased ROI and profit.

Moreover, remote connectivity provides the ability for remote troubleshooting and constant updates for the production line software, directly from our premises to your production line.

Inserting Unit

Switching from Turbo to Cyclone PC emitter and vice versa, for dripline production is a very simple procedure and the operator can easily perform it without any delays.

We have separated the production line in five main parts in order to collect real time data before and after each part. The data collected are processed and provide valuable information to the line operator for any production issue that is not associated with the alarm triggering process. This enables the operator to rapidly and easily identify and solve any production issue without delays which will result in production downtimes.

The inserting unit is designed with an advanced automatically retractable function, which allows the insertion of the stinger without the movement of the whole inserting system. This unique function provides a seamless operation, without any part tearing, while at the same time it doesn't require extensive space for its operation.

Our Smart Control function ensures extreme accuracy for emitter inserting into the drip irrigation pipe that can be achieved by the combination of our advanced software and

quality excellence of our production line components. The advanced algorithms we use, achieve the minimum emitter spacing fluctuation of the dripline in the industry.

The inserting unit is designed with a unique quality control mechanism for identifying defective emitters. This means that the overall production line operation will not stop for just one defective emitter, which will result in increased production costs, downtimes and scrap.

Our inserting unit is operated by two servo motors which can provide both flawless and seamless operation. Moreover, their design and capabilities ensure a literally limitless insertion rate, since there are no other mechanical limitations in their operation.

Extruder

Our extruders feature a special screw design, which was developed for extremely stable material feeding of the head, under all circumstances. The precise and excellent mix of the material is essential for high quality dripline production. Finally, the stress-free push of the material towards the crosshead



is vital for forming a perfect inner layer of the pipe, which will accommodate the emitters and will provide a smooth outer surface.

The extruder screw and the barrel are chemically processed for life-time, trouble free operation, in conjunction with the use of virgin raw materials. For the use of recycled raw materials, we offer a different solution of a bimetal construction of screw and barrel.

High quality top of the line gearbox is used, renowned for its completely noiseless operation, which also ensures the longevity of the equipment. We use ceramic resistors which secure the long-lasting resisting process at high-watt operation.

The advanced PID-controlled heating elements that we incorporate, makes sure that the temperature of all points along the surface of the pipe are the correct ones for the dripline production.

The manual screen changer that we are using, provides a very large filtration surface. Moreover, it has the ability to operate at very high pressures without any leakage. Finally, the change of the filter itself is very easy and doesn't require special tools or knowledge

from the operator.

We offer the option for a co-extruder which enables the use of recycled raw materials. Moreover, with the coextrusion function, the final product can be customized with the use of different color stripes. Those two benefits of the coextrusion allows the manufacturer to offer a very wide product range to the market, and fulfill every customer demand.

The interface that we have developed is extremely user friendly and utilizes an LCD screen for the easiest possible Human-Machine Interface (HMI) interaction.

The extruder is stabilized with the use of specially designed wheels in order to eliminate any possible vibration at its maximum operation.

The cooling methods that we have selected for the extruder are specially designed and developed to reduce the noise at the minimum possible level, which allows a communicative environment around the production line.

Crosshead

The crosshead carries our own design, in order to be able to cope with the extremely high-speed production. It incorporates

dedicated resistors inside the head for uniform temperature distribution. By being closer to the flow of the material inside the head, we achieve the optimal heat transfer and uniform temperature of the material and the space around it.

In order to produce a high-quality thin wall dripline at a high operating speed, a very low pressure of the material is essential. This is the reason why we have designed a unique crosshead capable of combining all desired elements.

Our crosshead is designed for extreme effectiveness and efficiency, making the tools changing process, extremely easy and less time consuming. We have managed to eliminate the pipe rotation tendency, by developing a completely new and innovative system which ensures the symmetrical distribution of pressure on the head outlet.

We want all parts of the crosshead to attain the quality excellence that we praise, therefore we have developed a special chemical process for hardening each individual part.

Vacuum Unit

The process of shaping the pipe, by adjusting the vacuum through advanced Proportional

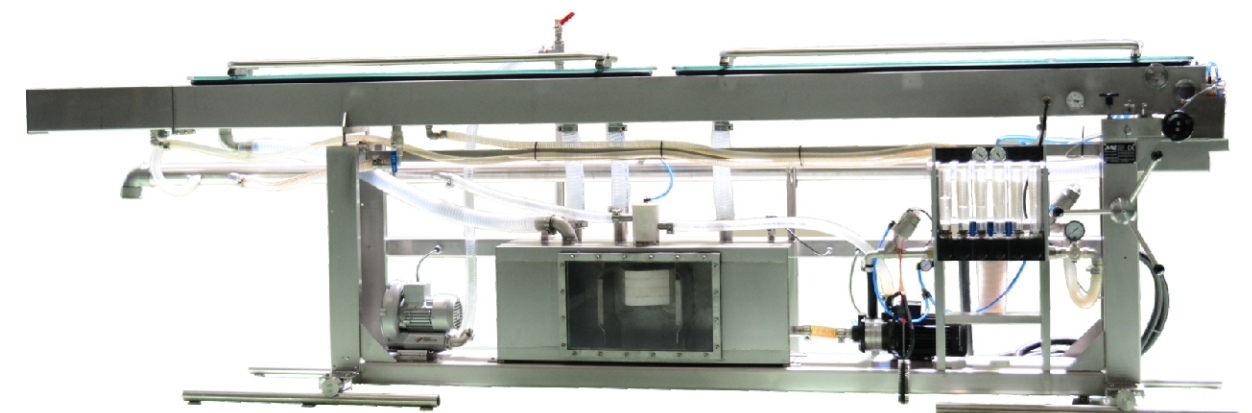


Integral and Derivative (PID) algorithms enable us to achieve an absolutely stable vacuum under pressure and water leveling.

Our vacuum design, includes a new welding and calibrating system that allows micro adjustments for the welding process. The micro adjustments can be performed by the line operator, from the external side of the vacuum bath without having to stop the production. This enables us to achieve outstanding welding under any circumstances.

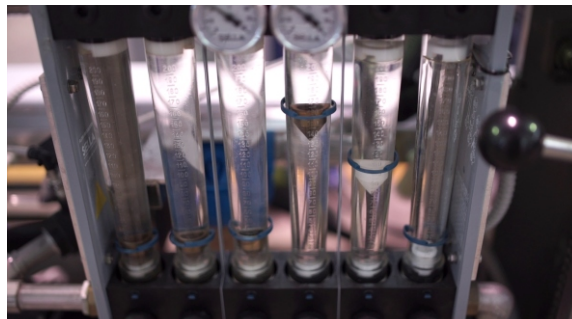
We provide exceptional built quality, with all parts of the vacuum unit manufactured from high quality stainless steel. We want to ensure that no rust will be created on the surfaces of the individual parts and that the whole unit will be robust and steady under operation.

We have developed an innovative method for



hole detection on the dripline, which utilizes both specially designed hardware and software. The intelligent algorithms used are a result of extensive research on probabilistic models.

Finally, the vacuum unit is designed in such a way that when the pipe is cut, there is no water going out of the system.



Water Circulation System

We have developed a closed loop water circulation system for every production line. The main advantage of this system is that each line is independent from the rest of the factory. This means that our production line is not affected in any way from the operation of other lines, or machinery in the factory. Moreover, since there is no need for a drainage system, the production floor is always clean and most importantly free of water transfer pipes.

The quality excellence that we praise is present in the closed loop system as well, with all parts manufactured from high quality stainless steel. By using the specific material, we make sure that no rust will be created on any surface and that the build quality is exceptional and consistent.

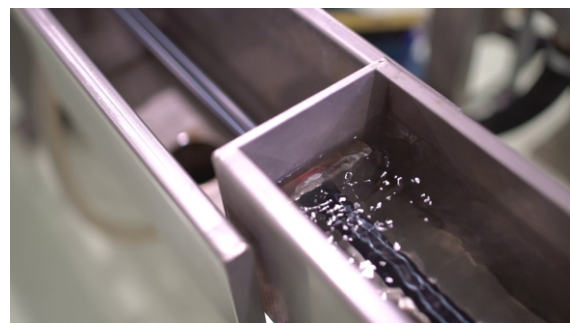
Cooling Unit

With our dedicated cooling unit, we achieve a uniform distribution of water with the ideal

temperature, along the complete length of the cooling through. By incorporating many water inlets and outlets on critical positions, we achieve an ideal for the task, high circulation rate. This provides an additional advantage, since it results a reduced need of overall cooling length, saving cost and valuable space on the production floor.

Just like the other parts of vacuum and cooling module, all parts of the cooling unit are manufactured from stainless steel, to ensure a rust free and long-lasting operation.

The unit carries a fully adjustable mechanism, in order to achieve the perfect alignment, in the minimum possible time, without any water leakage.



Dryer

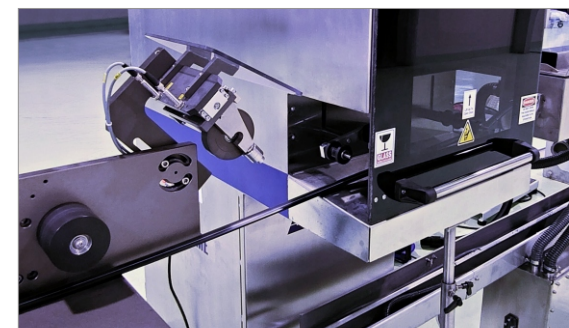
The unique design of our dryer which is a result of extensive research and experience, along with the ingenious usage of physics, ensures that the dripline is dried perfectly.

The innovative design of the air nozzles that we have developed, provide the ability to make the perfect adjustments of both the air speed and direction. This enables the perfect drying of the dripline in a very short time.

The complete drying system is a closed type one, which means that the production noise is the minimum possible.

Laser Printing Unit

Our R&D design and development team managed to incorporate, for the first time in an ultra high speed drip irrigation production line, a laser printing unit. This purpose built unit enables ultrafast marking of traceability and marketing information on the driplines. The flexibility and precision of the marking allows the manufacturers to mark clear and unique information of unparalleled quality. As all our production line units, it is produced with the highest quality materials to ensure excellent and long lasting printing quality.



Drilling Unit

The drilling process of the dripline is one of the most complicated and yet important functions of a drip irrigation production line. This is why we have put a lot of effort in designing and developing the most advanced drilling unit in the industry. Capable of coping with the drilling demand of a high-speed production, of more than 180 meters per minute. The operating capacity of our driller is up to 1.250 emitters per minute, making it the fastest drilling unit in this segment of the industry.

The dripline positioning is constantly adjusted automatically, in order to maintain the perfect position of the drip irrigation pipe under the driller and therefore perform a

perfect drill every time, at the highest operation speed.

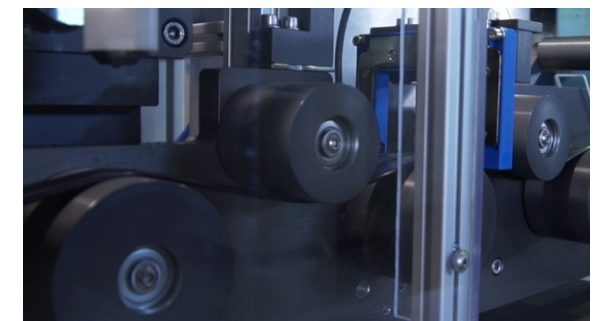
We have developed an advanced camera inspection system, which requires the minimum adjustment. The interconnectivity that we have developed between the camera inspection unit and the pipe correction module, enables the operation of both as a closed-loop system.

The unique advanced motion control algorithms that we have developed, enable us to almost eliminate the vibrations derived from drilling. It is extremely difficult to reduce the vibrations of the drilling unit, especially for the high-speed production lines.

We have developed a flap option, instead of a hole, for the water outlet which can be combined with the classic hole drilling and very easily interchanged. The cutting operation is performed by utilizing advanced algorithms. The flap inspection is also performed with the use of a software, specifically developed for the task.

The advanced and innovative design of every single part of the drilling unit, along with their exceptional quality, ensures that there are not any sensitive parts in the system that can be damaged from the extreme velocity of the drilling process.

The build quality of the drilling unit is extremely important since it is a module that



operates at high speed throughout its lifecycle, performing countless drills. This is the reason why it is manufactured with extremely high precision machinery and materials of the highest quality, carefully selected for the particular operation. Moreover, the special chemical treatment of all aluminum parts, ensure a life-time and trouble-free operation. Finally, all critical parts are constructed from a special aluminum alloy to achieve an extremely low weight.

We have designed and developed a unique air vacuum system, which removes and



stores the part of the pipe that has been cut during the drilling process. This leads to a totally clean space around the drilling unit, without any cutting chips.



Haul-Off

Caterpillar S180

The unique design of our caterpillar unit in conjunction with the software development and the controlled algorithms that we use, enable us to achieve a perfect and stable pulling of the dripline.



The great built quality of our caterpillar ensures its durability and the high performance of the unit. It is equipped with poly-V belts which guarantees a perfectly aligned movement of the belt and dripline. By designing it from scratch and carefully selecting special materials for our caterpillar,

we have managed to develop a noiseless haul off unit with no vibrations for the pull of a wide variety of driplines.

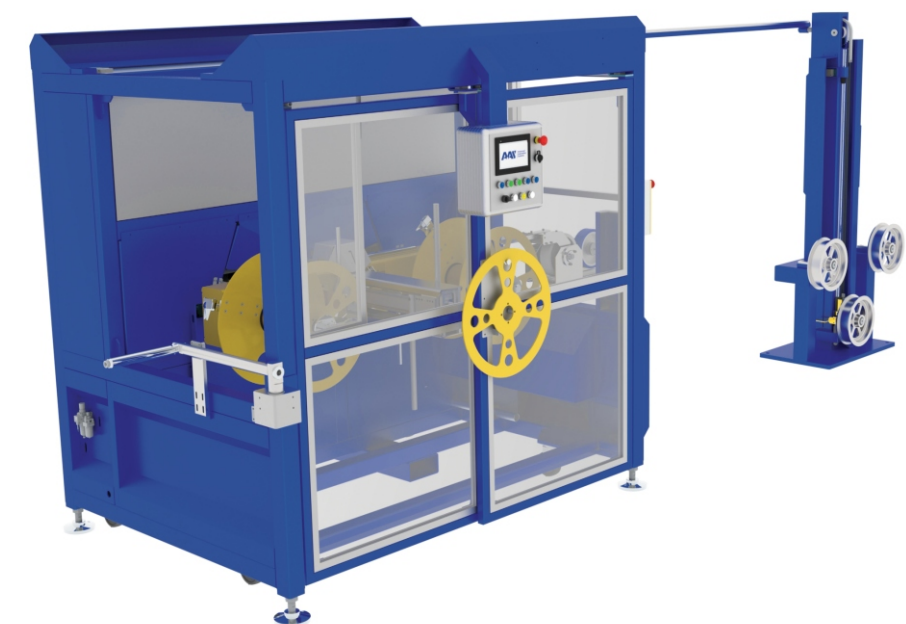
Automatic Coiler

S180 Flat Dripline Coiler

Our flat coiler is fully automatic and able to cope with the high-speed production of more than 180 meters per minute.

The special design of our coiler provides the ability to produce a wide range of products with a total coil width from 100mm and up to 330mm. The operation of the coiler has been designed in order to achieve a perfect coil change, at speeds in excess of 180 meters per minute. In order to provide to our partners the best possible performance of the coiler at 180m/min, an accumulator is developed for the task, which plays a significant role and enables us to achieve the desired results.

Our coiler's unique design, provides the ability to the line operator, to perfectly adjust the tension of the dripline during the coiling process, in both the steady and transient states.



Customization

The knowledge, experience and expertise of our dedicated production line development team, enables us to provide customized solutions for the specific bespoke needs of every market worldwide. Our 40-year experience in the drip irrigation industry, equips us with the ability to understand every dripline producer needs, goals and expectations. Moreover, we already know that the market each company operates in has its own challenges and we have solutions for each challenge.

In order to meet all drip irrigation production criteria and constraints of our partners, and at the same time deliver a perfectly operating production line with a great efficiency, we have developed a wide range of different

solutions for each production line component. All components provided are designed, developed and optimized by our R&D team and can be combined in order to reach the best possible outcome with the greatest production output and achieve the highest possible Return On Investment (ROI). The production line department will work with you hand in hand to develop the optimum dripline production solution for your individual needs. We can provide several alternatives that will enable you to achieve all your targets. We will thoroughly explain the benefits of each solution, in order to assist you with the optimal dripline production configuration.

Holistic Approach in Human Error Elimination

One of the critical elements in a production procedure is the human error. In an attempt to eliminate this issue, we have developed a holistic approach which involves three basic steps and minimizes the need for human intervention.

The first step is the development of an HMI which is extremely easy to operate and does not require any particular knowledge or skills. From the simple to understand graphics and the ease of access through the touch screens, our interface can be operated as easy as any tablet or smartphone.

The second one, is the advanced software that we have developed which provides the

ability to preprogram and set several production criteria that can be easily accessed and selected by the line operator. Moreover, the micro adjustments that might be needed are extremely easy and can be performed via the touch screens either on the beginning or the end of the line.

Last step but the most important one, is the extensive training that we provide to your production line supervisor. Our 40-year experience enables us to provide the highest possible training in both production line operation and immediate problem solving during production.

Commissioning

We have developed a unique production line commissioning experience for our partners. As soon as you place your order, we start working on it by assembling all components of your production line. The next step is to start operating the production line and run sever tests on every component, in order to ensure that it is operating as described. As soon as every test is completed and we produce an adequate quantity of high-quality dripline, we welcome you in our showroom for a comprehensive demonstration. You are able to see your production line operate for the first time and experience firsthand the quality excellence of our products and services.

After your approval, the production line is carefully packed and shipped to your factory.

Upon arrival of the production line, our dedicated commissioning officer will come to your premises to finalize the commissioning process which involves several steps. First of all, he inspects the production line components. The next step is to install them in place and make the appropriate alignments and adjustments. The final step involves both initializing the production line operation and at the same time train your line supervisor.

As soon as the production line runs smoothly, the dripline is produced according to specifications and your production team feels comfortable with the complete line operation, our commissioning officer can leave the premises and the commissioning is regarded complete.



Support

Products

We have designed and developed a wide range of emitters which can meet all irrigation needs worldwide. The enormous production capacity that we have in emitters guarantees a constant supply of the most important ingredient of a dripline.

Raw Materials

We can assist you in raw material selection for your dripline production at every level. Depending on availability at your specific area, we will determine the optimal solution which will best suit your production needs.

Spare Parts

We keep a wide range of spare parts and consumables at our warehouse in order to be

able to dispatch them immediately to your premises and therefore reduce the downtimes to the minimum possible.

Troubleshooting

In the unlikely event of a production shutdown due to a production line malfunction, the line operator has to follow the standard procedure which was thoroughly explained to him during the initial training process. If the problem persists and cannot be solved by following the standard procedure, we provide the ability to connect remotely with our premises and provide a solution online. Moreover, our technicians are always available for any issue that can not be solved by your maintenance team, offering immediate On-site support.

Constant Upgrades and Enhancements

In order to achieve the quality excellence that we praise, we never stop evolving. The extremely fast pace of technology evolution, combined with the advanced skills and experience of our team members, enables us to constantly improve our production lines. By utilizing the latest available technology, we constantly upgrade both the hardware and the software of our production lines in order to offer to you the best possible solution.

Hardware

The hardware upgrades that we design and develop, are compatible with both our current and previous model range. This means that we offer the opportunity for an older production line to be more productive and efficient. Another advantage of constantly improving several parts, is that of increased durability and reduction of the maintenance costs. Finally, we develop new product kits and sets that can be installed on the production lines to increase profitability and make an impact to your market by differentiating. For instance, the introduction of a flap outlet instead of a hole that can be easily installed and interchanged. The coextrusion kit that enables the production of dripline with one- or two-color lines.

Software

The software upgrades that we develop are designed for both functionality and convenience. The functional updates are designed to enhance the operation of several different parts and to allow for a more productive and at the same time cost effective overall operation. Moreover, every new hardware update needs its corresponding software update to function. The convenience updates have to do with the HMI ease of access and usability for error proof operation and the remote connectivity or the interconnectivity between the production lines.





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