



GAWGROUP

SPECIAL EDITION

ECON UNICOR[®] artec
AUSTRIAN RECYCLING TECHNOLOGY

K 2016



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Less fish, way more plastics?

It sounds quite incredible, even threatening! A study conducted by the renowned Ellen McArthur Foundation, published following the 21st UN Climate Conference in Paris in 2015, prognosticates that if the current consumption pattern persisted, by 2050 as much plastic as fishes, weighed in kilograms, will be swimming in the oceans of the world. At the same time, the plastics production will spike from 311 million tons (2014) to 1,125 million tons. This mass of plastics is being ascribed 20% of the worldwide petroleum consumption (2014: 6%), while the share of plastics as a major contributor to the ecologically harmful greenhouse gas emissions will spike from 1% to 15% [1].

Plastic - Threat or Opportunity?

In light of this and other similar critical assessments, the question we are bound to pose to ourselves is whether plastics (polymer materials) should assume greater relevance as a raw material that will ultimately contribute to the long-term sustainable development of our society. A more precise analysis of the different perspectives shows, surprisingly, that the response to this fundamental question is clearly positive, provided that politics, economy, and society are committed to taking the necessary steps in that direction.

GAW - Moving from future prospects to strategy

Their decision to strategically accelerate the development of the business unit dedicated to plastics engineering since 2012 demonstrates the commitment of the GAW-Group Pildner-Steinburg Holding GmbH to the social and economic challenges as well as potentials confronting us in the future. As a plant engineering company with special process knowhow in the industrial segments of paper and cellulose, automotive as well as automation technology, we typically think in terms of integrated processes. Our multidisciplinary competence, reliability, empathy and experience deriving from several decades have allowed us to develop high-utility and cost-effective solutions for our customers.

Sustainability and value enhancement are founded on three significant pillars:

- **Material development**, including production technology, e.g. formulation of new high-performance plastics/compounds and development of processing technology for manufacturing the raw materials of the future
- **Product development**, including manufacturing technology, e.g. development of innovative lightweight products made of plastics by creatively combining raw material features and product design as well as the design and the requisite manufacturing technology
- **Recycling economy** - development and manufacturing of plastics recycling processes that can be simply and optimally adapted, in alignment with their modular structure, to the respective raw materials that need to be treated

„Plast2Product - Waste2Value“

Based on our vision “Plast2Product - Waste2Value”, we position ourselves in the still emerging sector of plastics technology at decisive intersections of the lifecycle of plastics. Along with companies such as ... we offer unique, innovative technologies that generate for our customers a significant competitive edge on the market (Fig. 1).

We see the future of the plastics industry in the combination of sustainability and cost-effectiveness. Linear process thinking is a thing of the past. Value-added cycles are taking centre stage in the production and material exploitation processes. Our commitment to the plastics industry indicates not just that we have recognized the sign of our time, but that we will also shape it with our long-term perspectives.

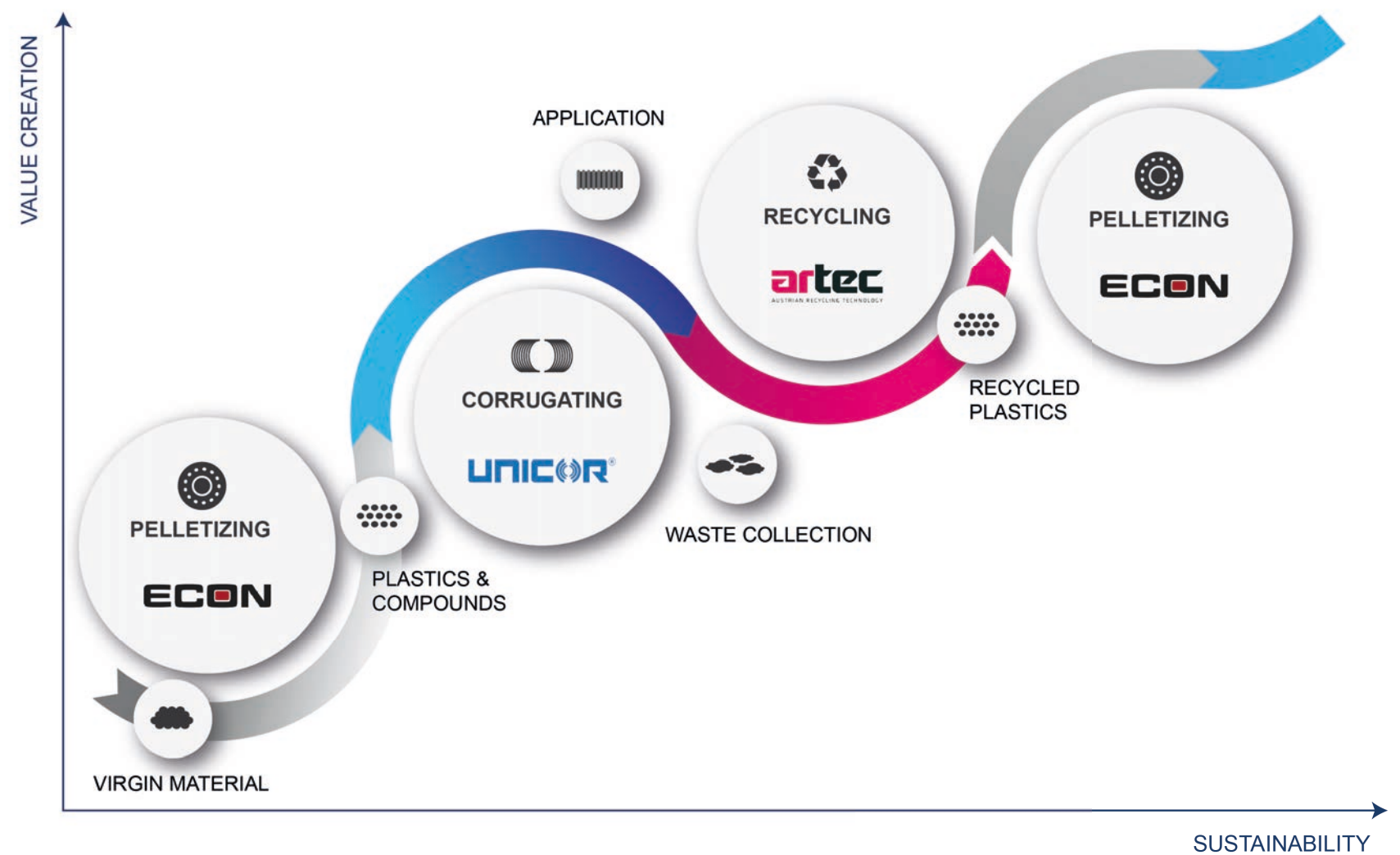
Material and social perspectives

Plastics cannot simply be dismissed from our reality. Modern packaging materials for food-stuffs and sanitary products, medical devices and medical-technical products, sports devices, components for vehicle manufactu-

Value-added chain in the lifecycle of plastics



2 Sustainability and added value through intelligent technologies for material production, product development and recycling



Continued from page 2

ring, electric and electronic goods, transportation systems and construction materials made of plastics etc., have gradually become indispensable parts of our economic and social progress - a world without plastics, thus, merely an utopia. The social and economic value of plastics derives from these success factors [2]:

- Material characteristics profiles varying across a wide range that can be tailored to specific requirements
- Processing technologies that allow efficient, highly flexible production of components, offering a high degree of freedom to design and extraordinary opportunities for function integration, as well as
- Increased cost-effectiveness through resource-conserving manufacturing, processing, application and recycling, coupled with an attractive global growth potential

Using the filtering and granulating technology of ECON, we allow companies that produce plastics today to define the raw materials of tomorrow. Profile systems made of corrugators of UNICOR are path-breaking in terms of their lightweight design, their long durability and cost-effectiveness.

Perspectives for energy efficiency

The predominant basic raw materials currently being used for plastics are fossils, primary raw materials, like oil, gas and coal. Only about 6% of the global crude oil consumption can be attributed to the production of plastics (85% are directly put into thermal use in industry, household, traffic or for generating energy). In comparison to metal or mineral raw materials, the energy consumption in the production of plastics is significantly less. Its low density, but also the excellent physical and chemical characteristics generate material savings (e.g. packaging foils), lightweight concepts

(e.g. vehicle/airplane construction) and less weight reduce the energy consumption in transportation and application. The use of insulating material creates, within the lifecycle, 150 times more energy savings than is necessary for its production. Modern foodstuffs packaging extends their shelf life and thus prevents losses, such as through premature spoilage or deterioration. LED lighting relies on the use of high-quality plastics and reduces the energy consumption, when compared to the conventional lighting technology, by about 80% in electricity consumption [2, 3].

Process solutions of the GAW Group integrate energy-intensive process steps and thereby create further valuable energy and cost savings. Knowledge- and data-based process management and material-science-based material competence enhance the cost-effectiveness, productivity, and quality of the plastics produced at our plants.

Recycling perspectives

In light of the currently overwhelming use of fossils as raw materials, plastics remain a valuable resource even at the end of their lifecycle. At this time in Europe, less than 30% of the packaging waste is recycled, worldwide it is only 14%. That raises the question of the adequacy of approaches to recycling solutions, even from an economic perspective [2]. Insufficient collection and non-compliant material processing of the packaging waste create an annual material loss for the global economy of up to 80-120 billion U.S. dollars. The recycling rate of plastics worldwide is significantly less than for paper, glass, aluminium, iron or steel. (60-90%) [1].

The recycling technology of ARTEC is optimized for energy consumption and can be tailored to optimally meet the demands of all standard commercial thermoplastic synthetics. Innovative, intelligent process technologies emerge for our customer partners through the interplay

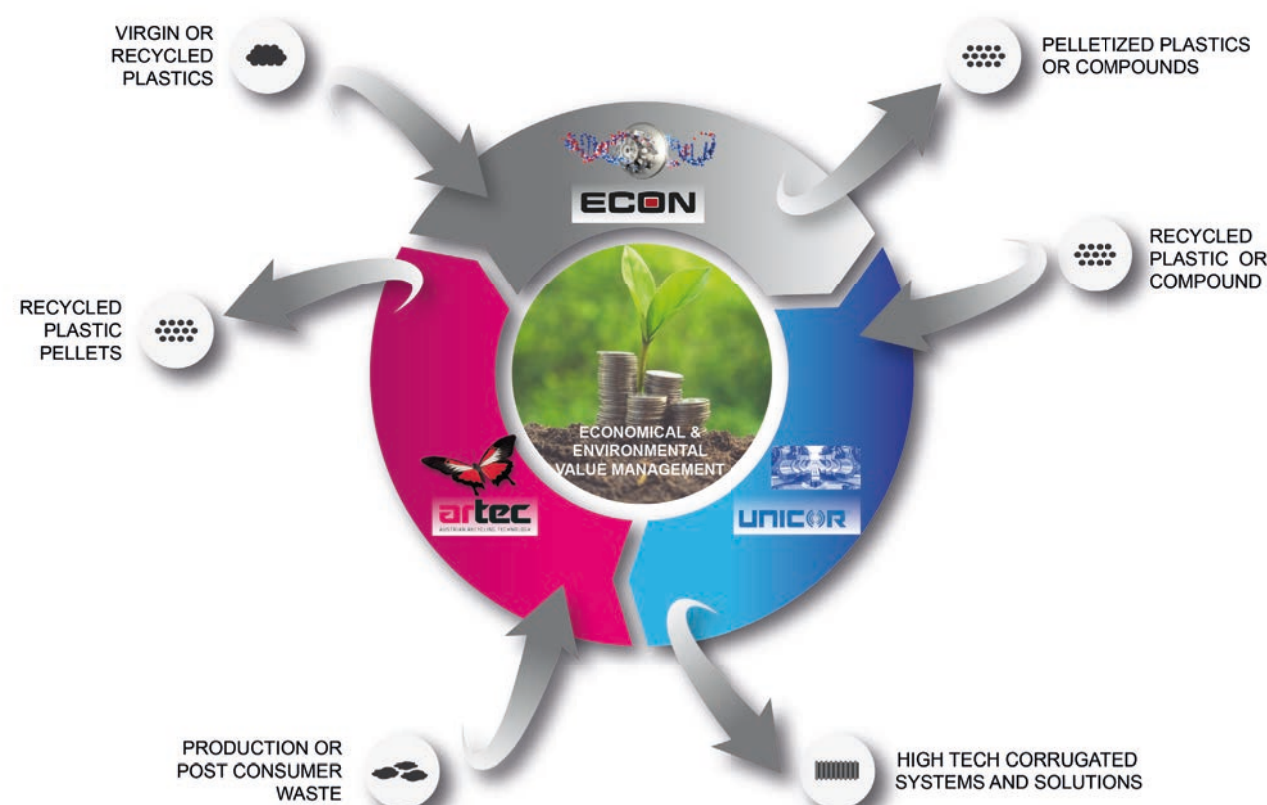
between the filtration and granulation technology of ECON, the corrugators of UNICOR and own automation competence.

It is our social obligation to ensure that the limited and thus valuable resources do not enter our environment (oceans, landscape, atmosphere) through uncontrolled material flows. The beneficial recycling of used plastics through innovative technology and their value-adding combination is our technological and economic challenge.

In light of that, we as the GAW Group find ourselves confronted with the challenge of continually developing our high competence in the existing companies and to integrate new synergistic technologies through cooperation. By combining these complementary competences, we offer our industrial customers in the plastics and recycling industry valuable, unique equipment and process technology, from planning right up to turnkey realization, towards a profitable business development (Fig 2).

ECON, UNICOR, ARTEC thereby stand for "economical & environmental value management" and are reliable and esteemed business partners for all challenges in the exciting lifecycle of plastics (Fig 3).

3 GAW Life-Cycle Solutions for the Plastics Industry



Sources

- [1] World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, The New Plastics Economy - Rethinking the future of plastics (2016, <http://www.ellenmacarthurfoundation.org/publications>)
- [2] R. W. Lang; Die Energiewende - Welchen Beitrag leisten Kunststoffe, Jahresmagazin Ingenieurwissenschaften, Im Fokus WAK - Kunststofftechnik, p. 70-73, ALPHA IGmbH (Oct. 2013)
- [3] H. Pitz, B. Brandt, R. Fehring, Die Auswirkungen von Kunststoffen auf Energieverbrauch und Treibhausgasemissionen in Europa; Bericht, denkstatt GmbH, Wien/Austria (June 2010)

Micro-granulating live, unique water & air granulation, and much more



Pelletizing is in our DNA ... in all shapes and sizes

As in the previous K trade fairs, an ECON underwater granulation will be demonstrated live even in 2016. The special feature this year: Microgranules will be produced with an EUP 150. The advantages of the ECON underwater granulation derive from a particularly efficient system of heat separation between the hot-melt nozzles and the perforated plate that is directly in contact with the cold water. High temperature differences between the cold water and melting temperatures can bring about the "freezing" of individual or all extrusion strands. In the production of the microgranules, this danger is particularly high owing to the very small exit holes (Ø 0.4 - 0.8 mm). In order to prevent that, the ECON concept provides for a constructive decoupling of the individual nozzles and perforated plate. The "thermal separation" facilitates the reduction of contact surface between the hot nozzles and the cooled-down perforated plate to a minimum.

For daily demonstrations that will take place between 11.30 a.m. and 3.30 p.m. KraussMaffei Berstorff will provide a twin-screw extruder ZE 42 BluePower, followed by a melt-X 1 melting pump provided by Eprotec. Subsequently, ECON's non-continuous ESD 70 screen changer will be installed, directly before the EUP 150 underwater granulation with the EWT 250 process water and drying system, including automatic belt filter.

Not only at the ECON booth, but also just one hallway away, at the booth of MAS Maschinen- und Anlagenbau Schulz, the underwater granulation process will be demonstrated using an EUP 10 laboratory machine. Furthermore, those interested have the opportunity to inspect an EUP 15 at UL TTC in Krefeld-Uerdingen. A shuttle bus has been provided for that purpose for the duration of 3 days while the trade fair.

Pelletizing is in our DNA ... in water and air

The next highlight at the trade fair and, at the same time, also world's first, is another laboratory equipment. ECON's smallest granulation will also be constructed as an integrated machine, EWA 10, water and air granulation. Especially for the purpose of laboratory applications, this combination offers benefits in terms of flexibility and space requirement. One single machine can be used both for air as well as underwater granulation. In just a few minutes, the equipment can be retrofitted to convert from air to underwater granulation and vice-versa. Used for air granulation, this test equipment is mainly intended for WPC, PE and PVC applications, with a maximum output of 10 kg/h. In the case of water applications, depending on the material features, it is possible, as with the EUP 10, to reach a throughput of up to 30 kg/h. With the EWA 10, there are a total of four design sizes of ECON water and air granulation system and thus this globally unique

equipment concept covers throughput of 1 to 600 kg/h.

Pelletizing is in our DNA ... but our cleaning is worth seeing too

The EPO 300 pyrolysis furnace completes ECON's machine exhibits at the K trade fair. The previously tried and tested concept was developed as a material and environmentally friendly method to clean extrusion and filter parts. At variable working temperatures, thermoplastics and mixed plastics are removed using vacuum without cleaning agents. The ECON pyrolysis furnaces have built-in oil-lubricated vacuum pumps and thus only requires an electric connection to be operated. No water is required. Emissions are adsorbed in an activated carbon filter.



2 ECON Water and air granulation



3 ECON Pyrolysis Furnace

Modul 2500 - Recycling in new Dimensions



The largest recycling plant that Artec has ever built was shipped to Damman in Saudi Arabia in February. According to Guntram Bock, Managing Director, the plant, which is 27 metres long, six metres wide and 40 tons in weight, is extraordinary not just because of its dimensions, but particularly owing to its capacity. It

can process up to 2.5 tons of foil waste in one hour, which involves granulating them to recycling pellets.

"If you look around in the recycling sector, the maximum throughput to have until now been achieved was, so to say, of two tons per hour.

ARTEC Module 2500: "Dimensions that have garnered international attention" – The largest recycling plant of Artec was delivered to Damman in Saudi Arabia.

Our plant has made a quantum leap," says Bock. The buyer is Rowad National Plastic, an industrial foil processing company who intends to use the plant to process the waste generated in the course of production. The contract is valued at 1.2 million euros.

The market opportunities are on the rise

Alexander Rinderhofer, Head of the GAW business unit, regards the current situation on the plastics recycling market as complex, which has to do with the low prices of raw material. Despite that, he prognosticates a spike in the operation of large recycling plants in Europe in the next ten years. Important in that context will be the European Framework Directives on Waste, which demand higher recycling rates.

The Artec plants can score here. "From one kilo of seemingly worthless waste, it is possible to generate a material value of 80 cents. That amounts to about 2000 euros per hour with the maximum machine-throughput," says Rinderhofer, doing the math.

1 Artec Modul 2500

UNICOR:
HALL 16/D 11

1 UNICOR Compact Die Head -
Quick Change System

UNICOR – QUSAC – QSERF: Innovation – Cost-Effectiveness – Partnership

QUSAC-campaign is shining the light on small corrugators and their benefits

With its new G2 machines, UNICOR is starting to conquer the market segment for tubes/pipes measuring 3 through 135 mm. Technically processed, the new corrugators offer enhanced performance, while costing less - two significant advantages compared to the international competitors!

Benefits? Numerous! Even the initial investment is more cost-effective for the customer owing to the new modular structure. Based on the model, it is possible to start with short production stages. The stages can be extended at any time to accommodate production expansion. In addition, the new maintenance-free servomotors are more resilient and offer optimized cooling performances, which yields higher output numbers. A uniform construction of all G2 machines as well as diverse other standardization and optimization measures also ensure that the costs can be driven down, while the efficiency is increased.

And what is "QUSAC"? The unique benefits of the G2-machine generation are highlighted in the current marketing campaign, QUSAC, whereby quality, usability and best costs are central themes. The market for small corrugators is gigantic compared to the quantities produced worldwide. With the G2 corrugators, UNICOR has created the best conditions to secure a huge market share in this product segment!

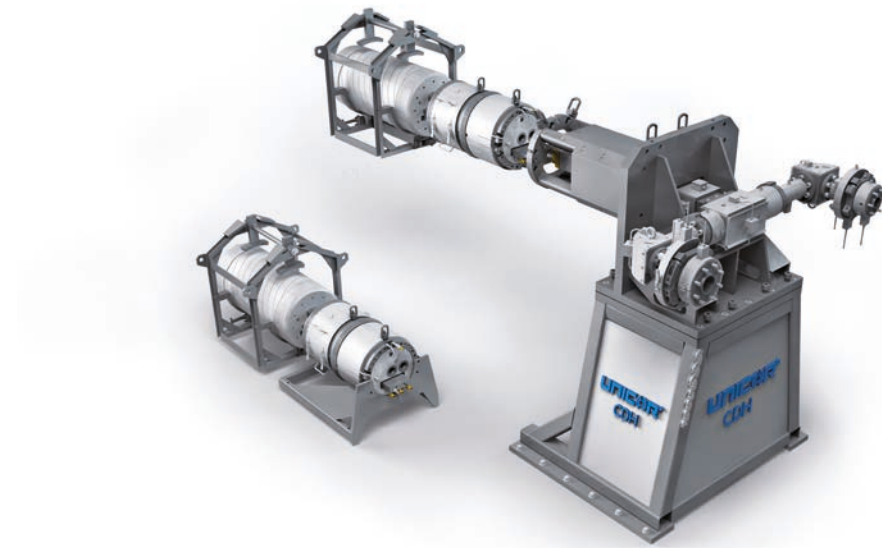
UC 36 - profitable in the long term in the production of corrugated pipes measuring 4.8 through 36 mm in diameter

UC 36 G2 promises the highest degree of cost-effectiveness

Even the recently presented UC 36 G2 corrugator brilliantly fulfils these standards. Production speeds of up to 60 m/min can be easily achieved. The production output of PVC corrugated pipe (cable conduit) for UC 36 with 80 pairs of mould blocks can reach up to 250 kg/h.

Pipe qualities of new dimension

UNICOR has consistently enhanced and optimized the design of the mould blocks to further improve the quality of the pipes. This has the effect of ensuring that all four exterior surfaces of the moulds are uniformly cooled, which ensures a particularly even heat distribution in



the mould blocks. The adjustment of the longitudinal extension of the mould blocks is no longer necessary thanks to a mechanical play allocation. Time-consuming readjustments are thereby completely dispensed with. In order to guarantee an extended durability of the corrugators with minimal maintenance costs, UNICOR uses built-in products of German suppliers. Servomotors, gears, touch-display, and more, bear the cachet "Made in Germany".

The basic machine of UNICOR UC 36 G2 is available with 50 pairs of mould blocks. They can be extended at any time to 65 or 80 pairs in order to enhance the production capacity. The vacuum, which is optional, also contributes, in that it facilitates the production of the corrugated pipes for the most diverse applications.

New extrusion dies head CDH - QCS (Fig. 1)

UNICOR's new extrusion die head CDH - QCS ("Quick Change System"), which is especially used for smaller nominal sizes on the UC 1200 and UC 1800, scores high not only for its quick dimension change mechanism: an innovatively designed spiral distributor as well as a perfectly symmetrical pre-distribution enable the best-possible material distribution. In addition, the colour-strip connector is integrated as the standard. The colour can be changed within a matter of only ten minutes, which means the scrap rate is minimized. Compared to other die heads, the material backpressure lies at a very low level. This opens a broad window for processing in relation to the materials and melt temperature.

QSERF - UNICOR is intensifying its service offerings

Service is always written LARGE at UNICOR. Whether in Königsberg (Kaliningrad), Wagga Wagga or Tanger Boukhalef, UNICOR supports its customers worldwide in all their challenges. If it must happen rapidly, support is offered over our telephone hotline or online. Regular updates and retrofitting measures ensure that you always have the latest technology - and will remain ahead of your competitors.

Was lies behind QSERF?

QSERF is a service system that accompanies our customers over the complete lifecycle of their machine. With that, we achieve a stronger and more permanent customer loyalty. In this process, a large variety of service packages tailored to the most diverse customer requirements are offered.

UNICOR is developing its own multi-layered die heads for electrical installations and cable conduits (Fig.: UNICOR multi-layered die head)

UNICOR is not only known for its corrugators. In fact, even the die head development is viewed as our strength. Precisely in the sector of small corrugated pipes, the multi-layer technology is gaining ever more importance. With its SWP 58-3L and TWP 90 (TWP 160/TWP270), UNICOR has recently garnered greater attention on the market. The SWP 58-3L is a modular die head, which is especially used in the production of

2 UNICOR Global Service -
New online Support

YOUR NEW UNICOR® ONLINE SUPPORT SERVICE

- ✦ EASY ACCESS WITH SMARTPHONE, TABLET OR LAPTOP
- ✦ COST EFFECTIVE SUPPORT FOR YOUR CORRUGATORS
- ✦ UNIVERSAL APPLICABLE FOR ALL CORRUGATORS



cable conduits. PE/PP/PA and PVC/ABS materials can be used to manufacture single-layered, double-layered as well as triple-layered corrugated pipes.

The TWP 90 was developed for double-wall corrugated pipes in the area of underground cable conduits.

In the process, the external, corrugated pipe wall consists of two layers. This allows our customers to use regranulates while also retaining the colour classification of the pipe varieties. For that, an innovatively designed dis-

tribution system was developed. This allows for a perfectly symmetrical pre-distribution, which again yields the thinnest surface layer and the best-possible colour coverage.

Noticeable updraft in the mechanical processing

Having implemented the targeted measures, UNICOR 2015 intensified the business unit dedicated to mechanical processing and contract manufacturing. Based on our 30-year experience, different new customers could be persuaded and gained. They also include the

Austrian company ECON of the GAW Group. UNICOR manufactures valve blocks and valve pistons for its screen changers.

More information on UNICOR's mechanical processing can be accessed online on www.unicor.de.



UNICOR®

SINGLE WALL PIPE DIE HEAD
3 LAYERS
SWP 58-3L BY UNICOR

- MODULAR DESIGN WITH THE POSSIBILITY TO PRODUCE 3 DIFFERENT MATERIAL LAYERS
- DIE SETS ARE COMPATIBLE FOR DIFFERENT APPLICATIONS
- HIGHEST FLEXIBILITY WITH LOW INITIAL INVESTMENT
- HOMOGENOUS WALL THICKNESS
- LOWEST MATERIAL COSTS

+ MAX. DIAMETER 58 MM
+ MATERIALS: PE, PP, PVC, ABS AND OTHERS
+ WIRE INSERTION POSSIBLE AT 2 LAYER PRODUCTION

UNICOR your **EXPERT**
in Innovation and Cost Savings

3 UNICOR multi-layered die head SWP 58-3L for electrical installations and cable conduits

Edelweiss Technology – From Waste To Value with ARTEC and ECON

For more information on the innovative recycling process solutions of ARTEC, please contact us at ECON: Hall 9/C 55 and at UNICOR: Hall 16/D11

With the new concept named "Edelweiss Technology", ARTEC offers material recycler and compounder factories the possibility to improve their added value by diversification and quality enhancement. Through process integration Edelweiss Technology allows to turn waste into high-quality products on "a single heat". Not only energy savings will be achieved, but also the shear-energy ratio in the plasticization, which is damaging the polymer structure, will be minimized – thus, material quality will be improved.

Recycling-Process

The recycling process starts with the cylindrical cutter-compactor where the foil- and fiber material, e.g. coming from an upstream washing process with moisture contents up to 12 %, is cut by a rotating blade set, compacted and - due to the generated frictional heat - automatically dried. The cutter-compactor feeds the material flakes by centrifugal force into the tangentially attached screw extruder where the plasticization takes place.

On the way through the extruder the plastic melt passes one or more degassing zones with applied vacuum extracting impurities and low-molecular polymer substances which are converted into a gaseous state. Subsequently the still contaminated plastic melt is running through a continuously working high-performance melt filtration system.

Compounding-Process

Using a melt pump the ultrapure plastic melt is pressure- and volume-constantly dosed into the twin-screw extruder either from top or side-wise. At this stage the important part of the refinement to high-end compounds takes place.

Individually, additives like mineral fillers, reinforcing fibers or color master batches can be added to the recycle melt enabling e.g. to

produce blow-extrusion-film compounds in almost virgin material quality (filled with CaCO₃ up to 70-80%) from foil recycle.

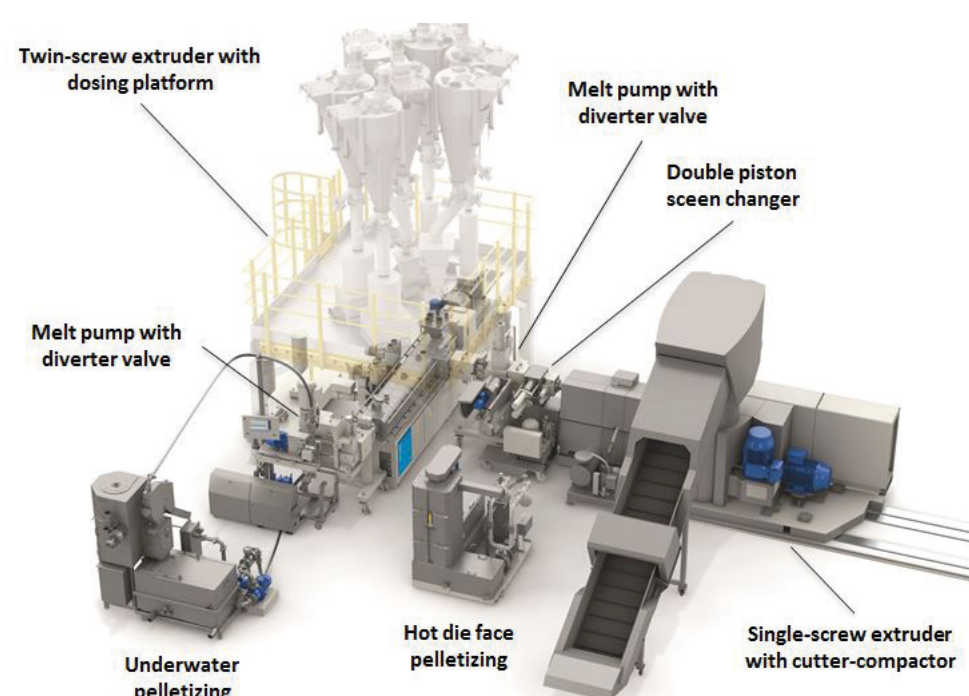
The two-stage process is optimally utilizing the excellent compound performance of the twin-screw extruder even with high additive contents. It also smartly avoids the problem of dosing material with a low bulk density, as the pre-drying and compacting takes place in the upstream cutter-compactor single-screw extruder unit.

From Waste to Product with Maximum Unit-Flexibility

Following the flexible plant concept, the recycling and compounding unit can be operated combined or individually as well. Accordingly pure recycling granulate can be produced with the recycling unit, while the compounding unit offers the possibility to be fed with

factory-new granulate as a pure compounder. Thereby, highest pellet quality is ensured through the ECON underwater pelletizing systems. ECON's unique and patented thermal insulation concept prevents freezing of die holes and allows a constant high pelletizing quality especially for compounds with high filler content. ECON and ARTEC are subsidiaries of GAW Group. Together with UNICOR in Germany the plastics technology division of GAW follows the strategy not only to provide leading edge technology in their segments but to integrate process technology.

A further process integration of e.g. blown film or pipe extrusion lines allows to turn waste directly into high-quality products without energy consuming or material degrading intermediate steps, thus allowing our customers to capture additional profit margins and to contribute to a sustainable development.



1 From Waste to Product through process integration of recycling, compounding and e.g. blown film or pipe extrusion

Converting to water-cooled corrugated pipe production in Latin America

A pipe manufacturer made a decision after many years of producing on air-cooled corrugators to use a water-cooled UNICOR system in Mexico for the first time.

UNICOR is expecting more business with North American and Latin American manufacturers who are still predominantly using the air-cooling system.

Better performance and higher output through water-cooled UNICOR corrugator

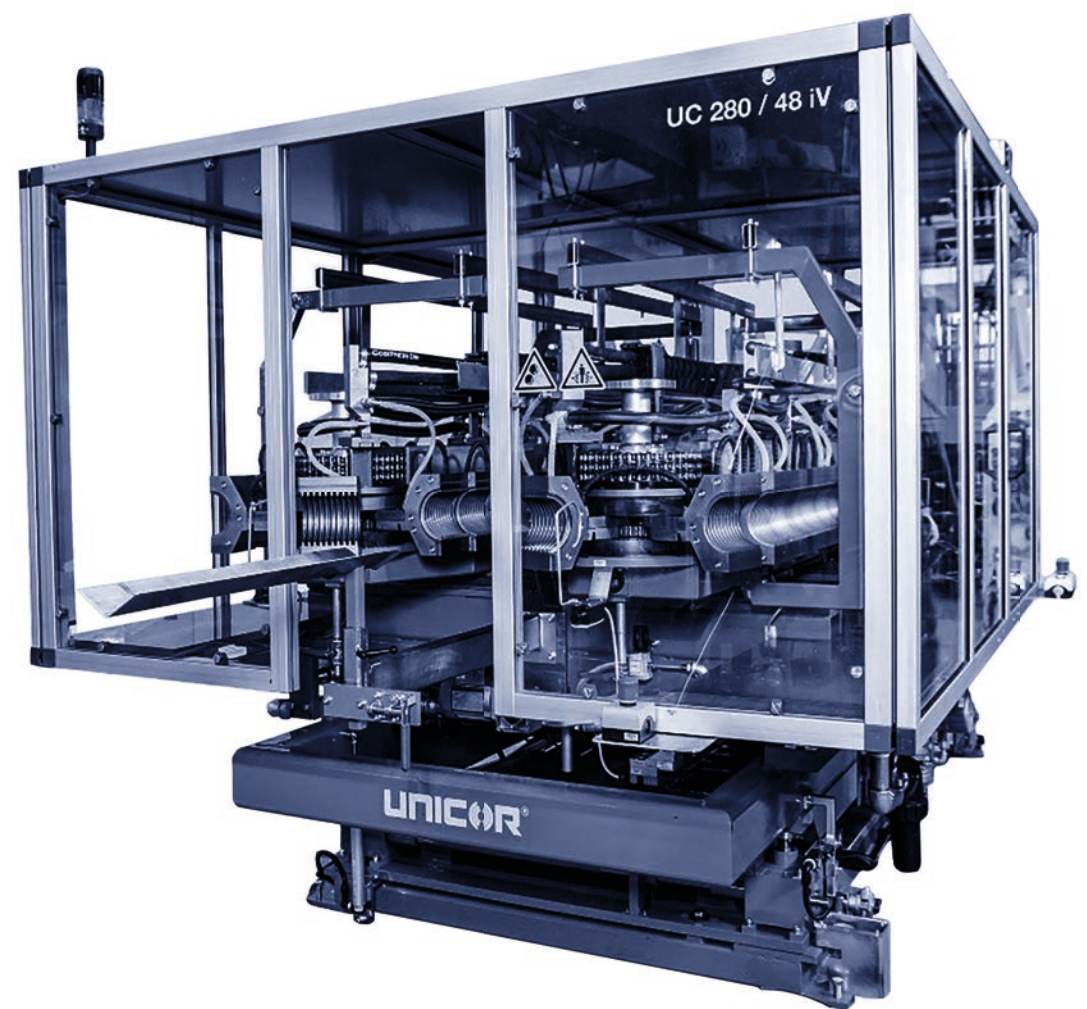
All round good experiences with water-cooled UNICOR corrugators was the most significant factor for one of the largest North American pipe manufacturers to decide to change the system even in Latin America. For the first time in the second half of 2016, a water-cooled UNICOR corrugator will be put into operation in the Mexican plant owned by a client of many years.

Higher outputs than ever before

Apart from the good experience with UNICOR corrugators, particularly the performance data, which were significantly higher in comparison with the air-cooled machines that had been used in Mexico until then, played an important role in the purchase decision.

The production volume in the medium pipe segment in Latin America currently stands at a very high level. Quicker production speeds that result in higher output quantities were, for that reason, indispensable for UNICOR's customers, in order to be able to complete the numerous customer orders on schedule, both quantitatively and qualitatively.

The new water-cooled UC 280/48 iV gave UNICOR the opportunity to play its trump card and to persuade the customer. Higher output values across the entire important medium pipe segment (diameter: 32 mm i.d. up to 280 mm o.d.) are benefits that air-cooled systems in this range can scarcely show.



1 Accelerated production speed owing to water-cooled production

IMPRINT

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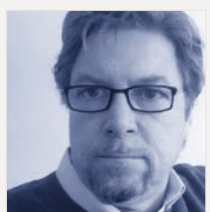
Photography
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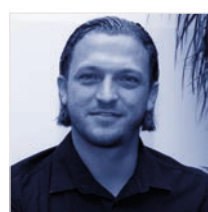
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DI Alexander Rinderhofer,
Head of GAW plastics
business unit

Our team at K 2016

artec
AUSTRIAN RECYCLING TECHNOLOGY



UNICOR



Team ARTEC - from left to right: Guntram Bock, Managing Director / Albert Grindling, Service After Sales / Alexander Strasser, Marketing and Sales / Christian Hangler, Marketing and Sales; Team Econ - from left to right: Gerhard Hehenberger, Managing Director / Andreas Iranek, After Sales Manager / Martin Steinkogler, Service Technician / Magdalena Deisl, Marketing / Uwe Neumann, Marketing and Sales Manager / Manfred Gebhart, Marketing and Sales / Michael Forstner, Marketing and Sales / Wolfgang Schaner, Marketing and Sales / Michael Wöger, Marketing and Sales / Vinubhai Chavda, Sales Director

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