

AGRU PE 100-RC aquaculture solutions

PIPING SYSTEMS | SEMI-FINISHED PRODUCTS | CONCRETE PROTECTIVE LINERS





The Plastics Experts.

AGRU offers a complete, high-quality product range of pipes, fittings, sheet stock and concrete protective liners made of polyethylene for safe and environmentally friendly aquaculture & fish farming solutions. Years of experience, a highly knowledgeable staff and state-of-the-art manufacturing equipment are the cornerstones for our high quality products.

The AGRU success story has been unfolding for seven decades. Founded in 1948 by Alois Gruber, who set the company on the course for plastic manufacturing, AGRU has become one of the world's most important single-source suppliers for piping systems, semi-finished products, concrete protective liners and lining systems made of engineered plastics. AGRU uses only the finest grade thermoplastic polymers as raw materials. When it comes to application-technical consulting, AGRU is your best partner in the field.

Quality

At AGRU, customer satisfaction comes first. Technical consultations, training courses, welding instructions and on site expert supervision are essential parts. The AGRU quality assurance system is compliant with ISO 9001:2015 and its environmental management system fulfils ISO 14001:2015. The occupational safety management system complies with ISO 45001:2018. This in turn ensures that the products comply with international norms, as monitored and evaluated on an ongoing basis by independent testing agencies.

The start-to-finish attention to quality ensures that the products meet and beat the strictest technical specifications, providing safe operation within gas, water and wastewater infrastructures.



AGRU PE 100-RC products for fish farming

Corrosion-free, shock and UV-resistant thermoplastic polyethylene products are essential to build a fish farm. The sea-based fish farming relies on the placement of net cages or floating closed-containments in the ocean. AGRU supplies pipes and fittings for the feed pipes, the floating surface rings of the cages and for water piping. AGRU semi-finished products are used to build customized fish tanks. When it comes to the land-based closed fish farming method, concrete tanks and efficient water piping systems are essential. However, the rough walls of the concrete basins can harm fishes, attract bacteria and are vulnerable to corrosion. To counter these problems, operators should apply AGRUSAFE concrete protective liners on the inside. For fish trawlers, the MINELINE piping system is the ideal solution to bring the catch undamaged below deck.

Concrete protective liners

Hygienic sealed concrete fish basins

Reinforced concrete basins equipped with a smooth inner liner

- protect the concrete from corrosion
- reduce the adhesion of bacteria
- diminish injuries to fish

AGRULINE PE 100-RC piping system

Floating surface collars and onshore water piping systems

Natural buoyancy and wave conformity

- components are designed to fit perfectly with one another
- durable and crack-resistant material PE 100-RC
- pipes and fittings are available between OD 20 mm and OD 3500 mm

Semi-finished products

Floating fish containments and onshore fish tanks

Corrosion-free comprehensive product range offered by AGRU

- low tank weight and natural buoyancy
- easy processing of the semi-finished products
- customized tank design for optimum use of existing space

MINELINE industrial piping system

Gentle fish transport below deck

Abrasion resistant, smooth piping system

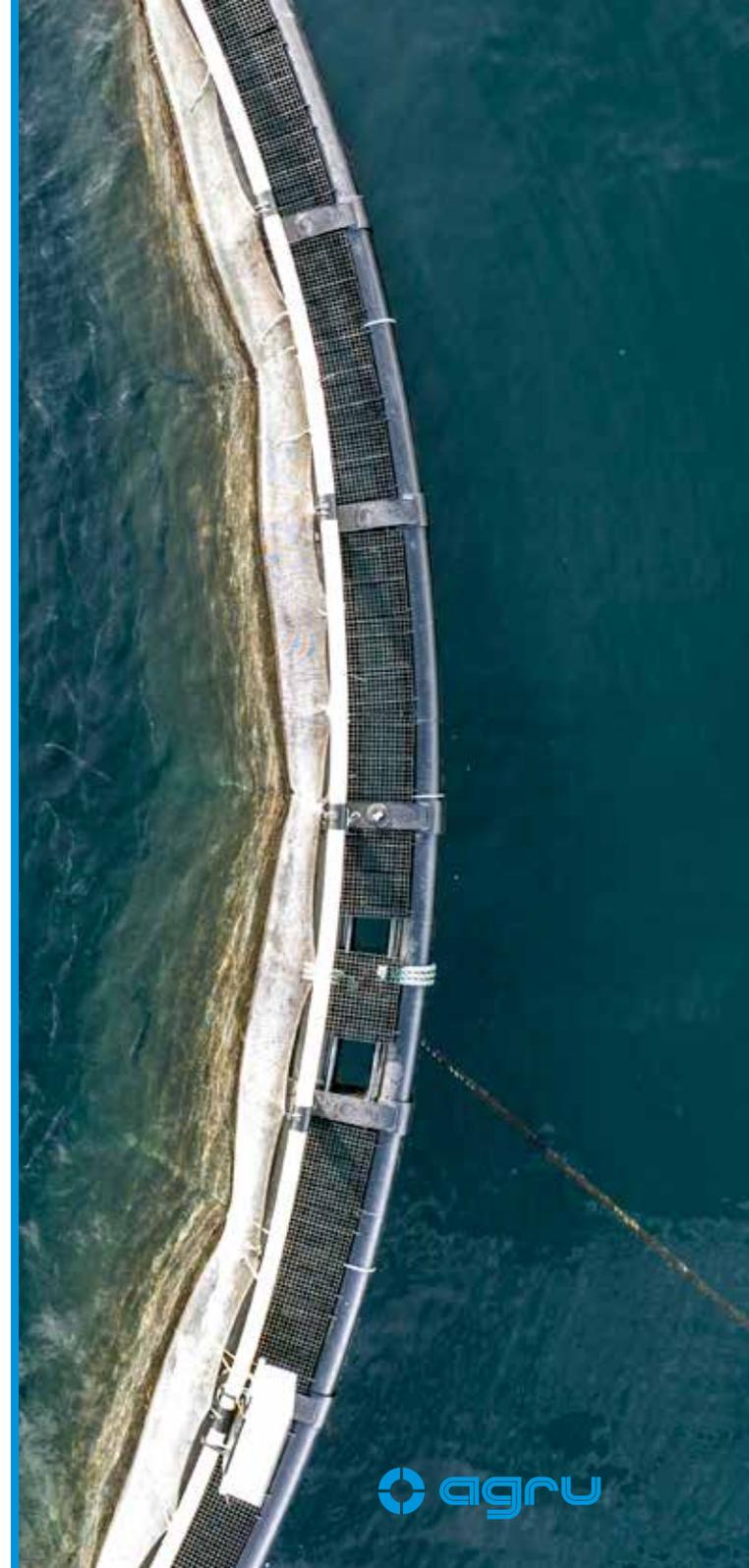
- improves the fish quality since the catch doesn't get damaged
- smooth inner surface for gentle fish transport
- is lightweight and increases load capacity

PE-Xel piping system

Electrically conductive feed pipes

Abrasion resistant system with highest flexibility

- electrically conductive to prevent discharging shocks
- thermal memory to survive storm waves and collision with boats
- resistant against the abrasion of feed pellets





Sea-based and land-based aquaculture

Common problems associated with aquaculture infrastructure include a need to enhance durability and corrosion resistance (sea-based containment) as well as growing costs to the bottom line due to inadequate concrete protection and leaking pipes/pipe joints (land-based containment).

AGRU **sea-based** aquaculture solutions address durability and operational costs to:

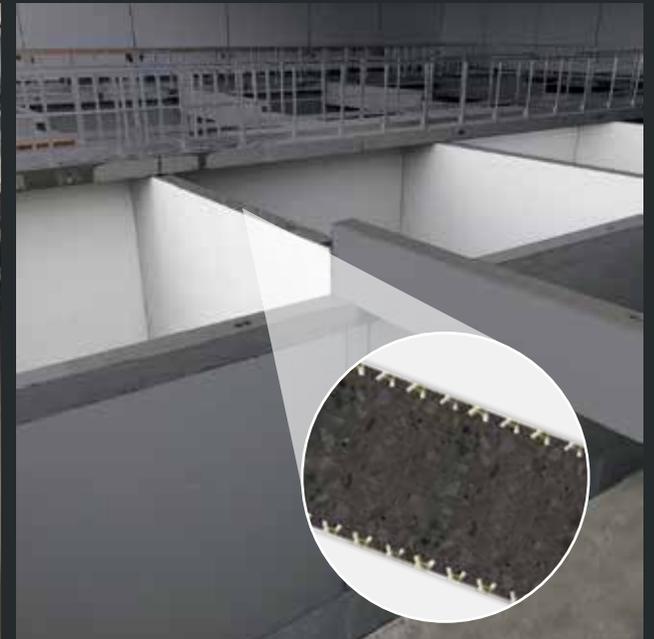
- Improve reliability and margins of safe and dependable yields by preventing biological growth or corrosion on containment walls (containment approach).
- Help ensure fish stock do not escape, which can be a significant setback as the fish farm would need to start over.
- Prevent nonnative fish stock from escaping into waters, which can incur high retrieval costs.



AGRU **land-based** aquaculture solutions address maintenance and operational costs to:

- Improve reliability and safe yields by preventing biological growth and the corrosion of containment walls.
- Reduce variable operating costs by preventing leaks in the piping system.
- Lower utilization and decreased life of existing facilities — leaks can reduce the service life of treatment and conveyance systems by requiring system expansions.

AGRU's aquaculture solutions incorporate three product categories: AGRU-Ultra Grip concrete protective liner (CPL), piping systems and semi-finished products. Together, these thermoplastic products support the creation of modern fish farms in a variety of environments.





Resistant cages and piping: AGRULINE

AGRULINE pipes and fittings

AGRULINE pipes are used for the surface collars of fish cages due to their buoyancy. For connecting the pipes, a wide array of fittings is available.

Features

- Welded pipes and fittings create leak-proof joints.
- Manufactured using state-of-the-art production processes and machined to perfection.
- Made of certified PE100-RC materials, that feature high resistance to slow crack growth and to corrosion as well as high rupture strength.
- Components are designed for interoperability with decades-spanning positive service record.
- The Plastics Experts are available to offer project-specific guidance for the best solution.

For complete details about AGRULINE pipes and fittings, visit: <https://www.agru.at/en/products/agruline-piping-systems>



AGRULINE
Piping System

Sea-based cage aquaculture

Sea-based fish farming means that the fish are transferred to outdoor ponds or sea-based structures for the final growth phase. Norwegian salmon farms, for instance, are up to 157 m in circumference and can hold as many as 200,000 fish. The cage approach uses a net attached to a floating structure while the full containment approach uses a floating enclosed tank.

The floating surface collars in caged designs are typically made with high-density polyethylene pipes. HDPE is favored due to its lower capital costs and its ability as a wave conformer—capable of bending with passing energy of a wave rather than remain rigid. The AGRULINE product group is ideally suited for this application!



Energy efficient water transport

A consistent, optimum rearing environment can be provided by land-based recirculating aquaculture systems, also called RAS systems. An efficient piping system is essential to recirculate the water. Many piping systems are affected by corrosion. Over time, this can lead to leaks which are costly in terms of exfiltration and waste. The use of PE 100-RC pipe fittings at key connection points makes for reliable joints that don't corrode and leak.

AGRULINE pipes can be used for water supply, outlet pipes, internal pipes, fittings and special parts in land based aquaculture. No corrosion is caused by salt water and the material doesn't deteriorate. From pipes and fittings up to complex pump headers - AGRU has the right components. Due to the smooth inner surface and sweep bends, the flow rate is maximized for minimal head loss and reduced energy costs.





Maintenance-free feed pipes: SurePEX

High resistance to waves and abrasion

Feed pipes suffer a lot of wear and tear on a fishfarm. They are constantly exposed to UV radiation, waves, salt water and low temperatures. Our cross-linked polyethylene SurePEX pipes are manufactured using high pressure and temperature. As a result, the pipes receive a thermal memory and return to their original form even after heavy movements due to storm waves or collisions with boats. Furthermore, the pellets that pass under high pressure through the pipes are highly abrasive.

Conventional HD-PE pipes soon reach their limits here. SurePEX pipes are corrosion-resistant, offer high resistance to abrasion and are highly flexible at the same time - even at extremely low temperatures. SurePEX pipes can be processed just as easily as conventional PE pipes, but are even more versatile. In addition to standard applications, they are also ideally suited for demanding applications, such as in the polar sea with sub-zero temperatures. The abrasion resistant smooth inner surface extends the life span and reduces feed costs. AGRU SurePEX pipes are available from OD 25 mm to OD 160 mm in SDR 11 in coils up to a 100 m length.



SurePEX Piping System

Electrically conductive PE-Xel pipes

Feed pipes can become statically charged due to the friction of the pellets on the inside pipe walls. With the newly developed material PE-Xel, AGRU combines the excellent properties of PE-Xa and PE-ESD-el through a special production process. As a result, our PE-Xel pipes are electrically conductive. The antistatic material PE-Xel dissipates electrostatic charges, avoiding electrical discharging shocks. PE-Xel pipes can be delivered in coils up to 100 m in length.

Easy offshore installation

In addition to the pipes AGRU also provides the matching electrofusion fittings, as well as the required welding equipment. Our feed pipes are also highly flexible and allow tight bending radii which facilitate the interconnection of several fish cages with the feed lines that transport the pellets from the feed barge. The minimum bending radius at 20 °C is 10 times the outer diameter. The smooth inner surface also minimizes the breakage of pellets, resulting in more efficient feeding. The resistance to abrasion caused by the pellets is several times higher than inside a conventional HD-PE pipe. As a consequence, the operational costs on the fishfarm decrease due to the prolonged lifespan of the pipelines.





Gentle fish transport: MINELINE

MINELINE is a coextruded three-layer piping system designed and tested especially for the transport of abrasive media. The innovative multi-layer design guarantees robustness and dependability for a longer lifespan and high cost-efficiency. It features a white outside protective layer, a PE 100-RC core pipe and the extreme abrasion resistant inner layer. This results in a longer service life compared to conventional PE or metal piping systems when conveying abrasive media. All MINELINE fittings have the abrasion-resistant inner layer, so there are no weak points in the installed system.

MINELINE pipes are available from OD 63 mm to OD 1200 mm in SDR 11 and SDR 17. For MINELINE fittings please see the table below:

PRODUCT RANGE OF MINELINE FITTINGS

Dimensions

Tee, reduced	63 – 1200 mm
Stub flange	63 – 1200 mm
Sweep bends	63 – 630 mm
Segmented bends	63 – 1200 mm



MINELINE
Piping System

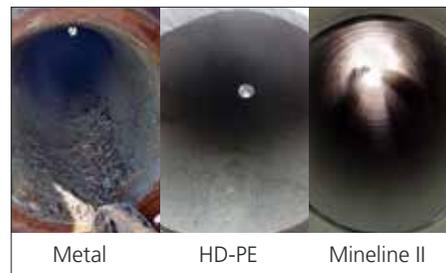
Improved fish quality and less maintenance

The large catch of trawl fish and deep-sea fish must be handled carefully. Usually, the catch is transported by stainless steel pipes below deck to cooled storage rooms. Unfortunately, the fish injure themselves on the sharp-edged welding seams and deform on impact with the hard steel walls of the piping system. MINELINE provides a remedy here. The extremely abrasion-resistant inner layer is soft and very smooth. This ensures that the catch is brought below deck as gently as possible. The almost unharmed fish achieve a higher selling price. Maintenance intervals of the piping systems are much longer compared to conventional PE or steel pipes. A welcome side effect is the light weight of the piping system, which allows higher payloads on the ship.



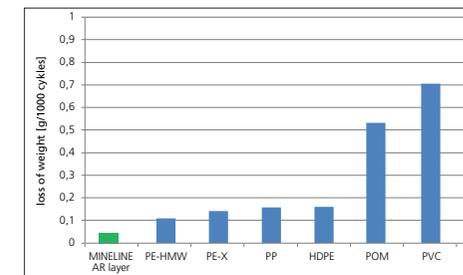
No corrosion and abrasion

When it comes to catch transport, fish and shellfish cause high friction if they are conveyed through a piping system. Scales, fins and shells literally grind the inner surfaces of the pipes. The abrasion-resistant MINELINE piping system offers many times the service life of a conventional PE piping system. In addition, MINELINE is permanently UV-resistant, corrosion-resistant and, even at low temperatures, resistant to the knocks and blows that can occur in rough fishing operations.



Tests prove outstanding abrasion resistance

AGRU MINELINE has been designed for the harsh conditions in mines, where abrasive slurry and sand must be pumped year-round. It has been tested several times and showed outstanding results in the coriolis sliding wear test, the taber abrasion test (ASTM D 4060) and the accelerated wear test. Weight loss after a certain number of cycles is measured. MINELINE wins all wear tests clearly. In comparison to metal and other plastics, MINELINE is the preferred piping system for all abrasive applications.





Firm fish tanks: Semi-Finished Products

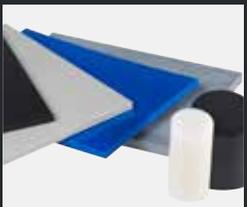
Semi-Finished Products

AGRU semi-finished products made of thermoplastic polyethylene are an excellent and durable solution for modern, wear-resistant fish tank constructions. AGRU manufactures semi-finished products made of high-grade polyethylene offering resistance to cracks, to corrosion and UV radiation. The hydrophobic properties are ideal for the application in sea water since the adhesion of bacteria and algae is inhibited.

Features

- Semi-finished products can be made of PE in different colors and sizes.
- Products offer high resistance to corrosion, cracks, shocks and UV radiation.
- Available as sheet stock, round bars and welding rod for easy fabrication.
- The Plastics Experts are available to offer project-specific guidance for the best solution.

For complete details about AGRU Semi-Finished Products, visit: <https://www.agru.at/en/products/semi-finished-products>



Semi-Finished Products

One stop shopping

Floor space is a valuable asset in industrial fish farming. In order to make optimum use of the available space, fish tanks must be manufactured in special diameters and heights. The comprehensive product range offered by AGRU provides significant advantages, because in addition to semi-finished products, pipes and diverse fittings are also used to construct a complete overall system.

Extruded PE sheets

2000 x 1000 mm	2 - 40 mm
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3000 x 1500 mm	3 - 50 mm
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4000 x 2000 mm	3 - 40 mm
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Pressed PE sheets

2000 x 1000 mm	10 - 120 mm
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4000 x 2000 mm	15 - 60 mm
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Round PE bar	15 - 640 mm
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Welding rod round, 3 kg roll	3 - 5 mm
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Welding rod round, 10 kg roll	
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Welding rod triangular rounded, 3 kg roll	
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Tailor-made closed containment solutions

Net cages are transparent to interactions between the farmed fish and wild aquatic life. Predators may seek ways to attack the fish, and sometimes toxic plankton drift into the cages and can kill hundreds of individuals. Wild fish, drawn by uneaten feed drifting through the net cages, can exchange parasites and diseases with the farmed fish. To prevent all this drawbacks, a floating, solid-walled enclosure that draws clean, plankton-free water from the depths beneath the farm site is another approach to sustainable fish farming.

AGRU semi-finished products are ideal construction materials for custom-built solid-walled enclosures. Because they are low in weight, provide natural buoyant capacity and are easy to process. Thermoformability ensures easy handling and the possibility to realise very complex geometrical forms. Users can work with various processing methods, including diverse proven joining technologies such as extrusion welding, hot gas welding, and butt welding.





Durable fish basins: ULTRA GRIP CPL

AGRU-Ultra Grip concrete protective liners

AGRU-Ultra Grip offers unparalleled pull out resistance through a revolutionary redesign of the 13 mm Sure-Grip anchor. The highly water-repellent inner liner keeps fish basins clean.

Features

- Standard comes as Type 562, with 13 mm stud height.
- Pull out resistance of up to 820 kN/m² with HDPE at 20 °C.
- Manufactured from high grade HDPE
- Distinctive V-shape anchor can resist a long-term sustained backpressure of up to 1.75 bar (at 20 °C).
- Product is available in rolls and sheets of up to 5000 mm in width and up to 12 mm in thickness.
- The Plastics Experts are available to offer project-specific guidance for the best solution.

For complete details about AGRU-Ultra Grip, visit:
<https://www.agru.at/en/products/concrete-protection>



Concrete
Protective Liners

One solution from broodstock to harvest

The centerpiece of land based aquaculture are advanced fish basin solutions that hold the fish from broodstock to harvest. Whether it is a flow trough system or recirculated system, the basins need a robust and safe structure which is built in most cases of concrete. The installation of an internal concrete protective liner keeps the fish basins clean since HDPE is highly water-repellent and provides good self-cleaning.

The smooth and hygienic inner liner prevents the outbreak of diseases through pathogenic bacteria that otherwise can colonize the rough concrete walls. The CPL reduces the buildup of material within the tank and keeps the concrete from direct contact with the water, improving the service life of the structure and reducing the need for frequent maintenance. Additionally, the smooth surface of the CPL prevents injuries to the fish in the event that the fish may brush up against the walls.

Healthy fish through hygienic surfaces

Essential to modern land-based aquaculture is proper tank design, right tank material and efficient piping system. The tank design should support self-cleaning ability. Circular tanks, for instance, offer the highest self-cleaning ability as the fluid flow characteristics work the best with this design. For huge tanks, the right material is concrete. However, to get the most performance out of concrete in a recirculation system, a concrete protective liner (CPL) is recommended. White, grey, and other lighter colored CPL liners enhance the performance of fish farming.





The Plastics Experts.

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Your distributor

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Illustrations are generic and for reference only.

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