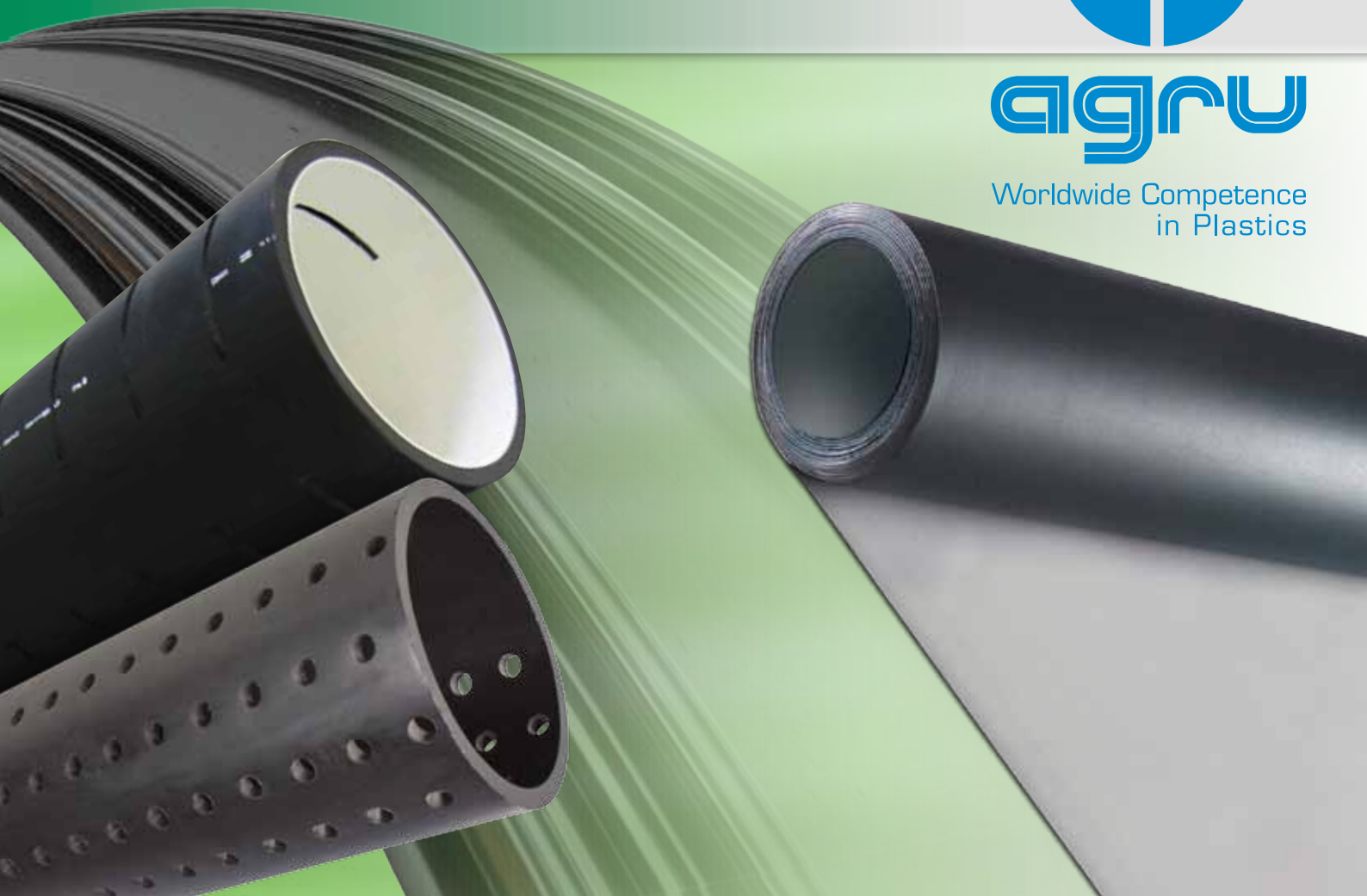


# LINING SYSTEMS



**agru**

Worldwide Competence  
in Plastics





## Hydraulic engineering

- Storage ponds for hydro electric power stations
- Water canals
- Alpine storage ponds for artificial snow production
- Reservoirs for agriculture
- Fire fighting basins
- Artificial ponds, pools for water parks
- Floating covers



## Groundwater protection

- Retention basins
- Liquid manure storage ponds and basins
- Safety collecting basins for chemicals
- Secondary containment areas for oil and fuel tanks
- Containment for airplane de-icing stations
- Heap leach pads in the mining industry



## Landfill engineering

- Base sealing
- Capping
- Drainage and gas collection
- Temporary capping

# YOU CAN TRUST!

## Tunnel engineering

- Cut and cover construction
- Drill and blast construction (NATM)
- Tubbing construction (TBM)
- Umbrella or full round sealing



## Water proof constructions

- Foundation sealing against aggressive sub soil
- Basement sealing against groundwater
- Storage tanks
- Lining of barns at pig and chicken farms
- Lining of concrete dams



## Photovoltaik

- Integrated PV modules for flat roofs
- PV modules for landfill cappings





## Power supply industry

The significance of water resources is continuously increasing, therefore it is necessary to increase the efficiency of new as well as existing hydro power stations. Although alternative energy like solar power, photovoltaik or wind generators are on the rise, hydro electric power plants are essential during times of peak demand, night and wind loss. AGRU provides highest quality liners, which are the base for leakproof dams and reservoirs in the hydro electric power industry.

Regardless of the application AGRU supplies highest quality liners, pipes and fittings to ensure a safe and reliable electrical power supply.

# HYDRAULIC ENGINEERING



## Leisure and tourism

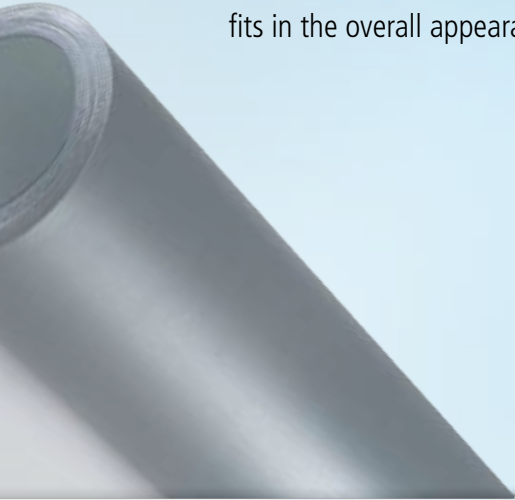
Tourism is an important branch of the economy and has very high requirements for sealing systems. Water reservoirs for the production of artificial snow or ponds and channels in water parks as well as pools or artificial lakes require best quality liners.

AGRU produces for those applications highest quality liners made of polyolefin materials to provide leakproof sealing systems. Products such as pipes, fittings, sheets are made of similar materials and are therefore compatible with AGRU liners. This guarantees a high quality construction.



## Agriculture

In regions where rain is seasonal or very minimal, water reservoirs are of big importance to provide water for agriculture. Engineered products of AGRU such as liners, pipes and fittings provide the system components for a steady water supply in this field. The use of high quality products and various liner surface structures enables the installer to design an optimized water reservoir which fits in the overall appearance of the landscape.



## PERFECT SOLUTIONS

### Industrial applications

At storage yards and manipulation areas for hazardous materials a secondary containment system is required. This lining guarantees that in case of a spillage or defect neither the soil nor the groundwater are contaminated.

HDPE liners with its excellent mechanical properties fulfill those high requirements. Because of the outstanding chemical and biological resistance of the material the risk of subsoil or groundwater contamination is impossible.





## Oil industry

- Lining of tank farm subbase
- Lining of petrol station subbase
- Lining of sludge storage lagoons
- Foundation lining of filling stations
- Lining of temporary storage areas for contaminated soil

# GROUNDWATER PROTECTION



## Mining industry

The so called "heap leach process" is used in the mining industry to get the highest sufficiency of minerals. That means huge areas have to be lined with a material withstanding this process. Chemicals and bacteria are used in this process to separate the minerals from the crushed rock. A perfect sealing system is essential to avoid ground water contamination. In those constructed pads the crushed crude ore is hauled in various layers. Piping systems in between collect the leachate and transport it to solution ponds. There it is processed and the minerals are separated from the solution.

AGRU is a system supplier and has an extensive product range from liners, pipes, fittings and accessories made of polyolefins. This ensures an outstanding product compatibility.

## Corrosion protection

- Foundation protection
- Basement sealing against aggressive groundwater
- Underfloor lining of production and warehouse floors
- Barrier against radiation
- Lining of livestock buildings
- Lining of salt storage bins



# CONSTRUCTION SEALING

## Civil construction

Many concrete basements are below ground water level. In many cases the sub soil is very aggressive (e.g. brackish water) and therefore causes corrosion of the concrete. In order to avoid this and to ensure a long lifetime of the building, AGRU provides highest quality liners and concrete protective liners made of polyethylene and polypropylene.

These products guarantee an extended lifetime of those constructions.





## Base sealing

The concept of landfill engineering has changed over the years. Whereas in the past communal waste was only dumped in landfills, new regulations require incinerators for energy re-claim. Only inert waste such as ashes will be stored in landfill sites.

Efficient environmental protection requires most advanced technologies and custom-made materials. For this case, the method of calendaring is most suitable for the production of seamless liners out of HDPE or LLDPE, with smooth surfaces and/or structured surfaces up to 7m width. The unique range of structured liners allow the sealing of extremely steep slopes and therefore lead to a supplementary expansion of the landfill capacity.

# LANDFILL ENGINEERING



## Leachate collection

Leachate collecting systems are of essential importance in landfill operations. The function of leachate collection depends on all single components of the whole system.

Pipes and collecting chambers or basins are subject to the same chemical attack as the liner. Therefore the high chemical resistance of all AGRU materials such as HDPE and PP fulfill those high requirements. It is also very important that all components are compatible with regards to welding.

## Capping

The concept of landfill capping consists has the aim to incapsulate the stored waste. Capping with AGRU-liners is an efficient and economical solution. A homogenous seamed liner is capable to meet the requirements of a non permeable sealing system. Furthermore AGRU liners are root and rodent resistant. The installation of them without additional mineralic layers is not only more cost effective, it increases also the landfill capacity. The designed construction configuration and the selection of material (eg. HDPE-LLDPE-VLDPE-FPP) is regulated in various country specific standards and waste requirements.



# CAPPING

## Bio gas systems

State of the art landfill engineering includes a functional methane gas collection system to minimize emissions. To fulfill those requirements landfill designers prefer the multi barrier concept where even during landfill operation a functional gas collecting system is operating.

### Vertical gas collection:

Due to the multi barrier concept the vertical gas collection is more efficient than the horizontal collecting system.





## Drill and blast construction

### Configuration:

- Shotcrete
- Sealing with AGRU liners
- Self supporting inner shell

Underground construction work requires high quality standards in terms of design, construction, logistical chains and safety considerations. Therefore the design life of such constructions has a minimum of 100 years. One important premise for achieving such design life is the insulation of the structure against mountain and ground water. The proper sealing of underground construction therefore is an inherent part of the design. The liner protects the structure and the interior equipment against corrosion, avoids utilization discontinuities and prevents malfunction of sensitive electronic and technical equipment.

AGRU lining systems meets those requirements.

# TUNNEL ENGINEERING



## Tubbing construction

The installation of tunnel liners usually requires high manual labor because the liner is welded to the fixation discs, which are secured to the concrete wall (shot concrete). By comparison the AGRU Easy-Fix system uses hook and loop fasteners, which allow faster and easier installation. The AGRUFLEX tunnel liner backed with geotextile is then attached to the fixation discs by applying a certain pressure. Readjustment of the liner is possible. The result is a faster and therefore more economic installation.

### Hot air installation system:

The concrete shell is lined with a geotextile and also the tunnel liner made of VLDPE is fabric backed. A moveable hot air bar which is part of the semi automatic scaffolding joins the two textile surfaces and holds the liner in place.

### Hotmelt system for tubbing construction:

A rotateable hot melt glue bar - which is a part of the semi automatic scaffolding - sprays the necessary glue directly onto the tubbing surface. The integrated pressure rolls on the scaffolding apply the required pressure to perform the bonding of the fleece backed VLDPE line on the tunnel wall.



## Cut and cover construction

... are easier to install in comparison to drilled tunnels as the geotextiles and liners are placed on the already finished load bearing inner shell. There is no need for overhead installation and welding. The installation time on such constructions is less than on any other systems. Even alternative materials such as HDPE can be considered as sealing components.

### Water stop profiles:

The waterproofing of tunnel constructions is essential for the service life of the whole structure. Modern tunnel insulations are designed to offer the possibility for repairs of hollow spots or leaking areas with special injection resins. At casting joints of the concrete shell waterstop profiles are installed to create separated compartments. Integrated injection hose clamps with outlets at certain distances guarantee well-directed injections of resin at repair sections.

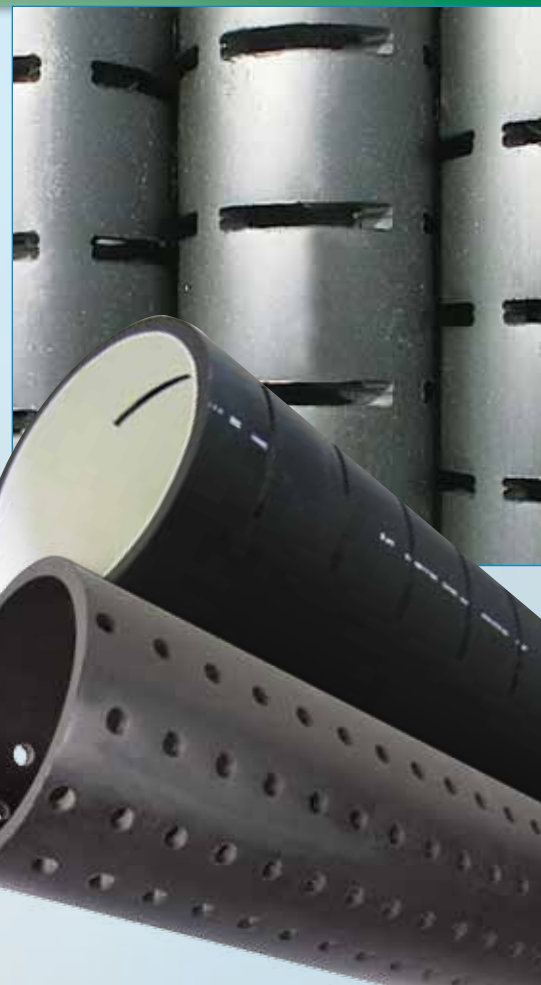


## CIVIL CONSTRUCTION

### Drainage systems

There are several different drainage systems available. Depending on the local and structural conditions an undrained, partly drained or drained system needs to be installed. The design of this system as well as choosing suitable materials is of great importance. AGRU supplies pipes with smooth surfaces to avoid deposits. Bright colored inside walls provide optimal conditions for inspections with cameras.

Projects without drainage can cause damage to the complete system.





The folder

## AUSTROPLAN Photovoltaik-Liner

Liner integrated photovoltaik for generations

- Fast and easy installation
- High efficient energy output even at elevated temperatures or overcasted sky
- Expanded shade tolerance due to bypass diodes
- Established market system
- Prefabricated elements (roof liner/PV elements)
- Light weight and therefore statical benefits
- Direct export of solar power to the electricity provider



## ● LINING SYSTEMS

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