



Filter Unit



Natural protection for the environment

- Embankments
- Earthworks
- Habor defenses
- Emergency interventions
- Beach stabilization
- Temporary installatinos
- Bridge pile protection
- River bed and bank construction
- Shore preservation for lakes and seas
- Ballast for sub-sea pipes
- Anti-scouring protection
- Artificial reefs
- Creating ecosystems



History

Kyowa, founded in 1969, is the leading company in the Japanese market for mesh sheets and safety nets for industry and construction. The Filter Unit was used for the first time in 1987, to protect the foundations of the great bridge at Akashi (world's longest span, with a total length of 3,911m). For more than 20 years, the Filter Unit has been widely used in civil engineering for rivers and coastal works.

→ Reference projects, labels and certifications

Over **13,000 reference sites** in Japan, with over **600,000 Filter Units** installed.

- 1995, 1998, 2000 & 2004, Certificate of Technical Testing, awarded by the **Public Works Research Institute** (Japanese national testing body)
- 2004 Kyowa Co. Ltd achieves **ISO 14001 certification**
- 2004 the Ecogreen type is awarded the **"Ecomark" label**
- Since 1996, **Filter Units** have been part of the equipment used by the Japanese Civil Defense forces
- 2008 **Filter Unit** achieve **CE labeling for 7 types of products**, durability under UV exposure up to 30 years, depending on quality



Main advantages

→ Hydraulics



- Adapts perfectly to all soils**
- Highly efficient coverage
 - Attenuation of energy

→ Ecology



- Supports natural vegetation**
- Encourages the development of fauna and flora

→ Execution/Implementation



- Speed of execution/Reduction in labor costs**
- Flexibility of the product and simple mechanization for installation
 - Installed dry or underwater



TECHNICAL CHARACTERISTICS

→ Synthetic fiber material

The **Filter Unit** is made of nylon and polyester. It is ideal for all hydraulic works as it is non-corrosive, rot proof, non-rusting and weather-resistant.

- *Suppleness and flexibility of the fiber makes it adaptable to all soils and reliefs*
- *Increased speed of execution*
- *Extended lifetime*

Product characteristics

S type	Nylon
Ecogreen type	Recycled polyester



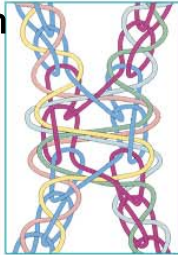
S type
Double mesh



Ecogreen type
Double net

→ Structure of the mesh

- The specific structure of the Raschel® mesh guarantees the stability of the **Filter Unit** by preventing the mesh thread from unraveling even if there is a break.
- Highly resistant to impacts and pressure



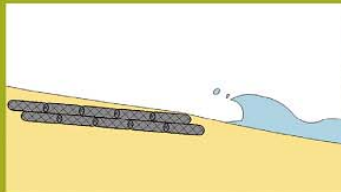
→ Resistance* to currents without being moved

Tonnage per FU	Unit	Grouped
2 tons	3.1m/sec	4.7m/sec
4 tons	3.5m/sec	5.3m/sec
6 tons	3.7m/sec	5.6m/sec
8 tons	3.9m/sec	5.9m/sec

**Safety margin/weight= × 1.5 included

Foot protection works

- Sea dike foot protection serving as roadway Beach stabilization



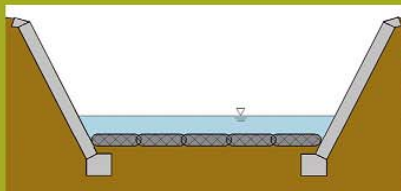
Works in progress



After 16 months



- Protection of river bed



- Protection-Dike Foot



TECHNICAL CHARACTERISTICS

→ Standards relating to applications

Filter Unit is used for all types of strengthening and separation works

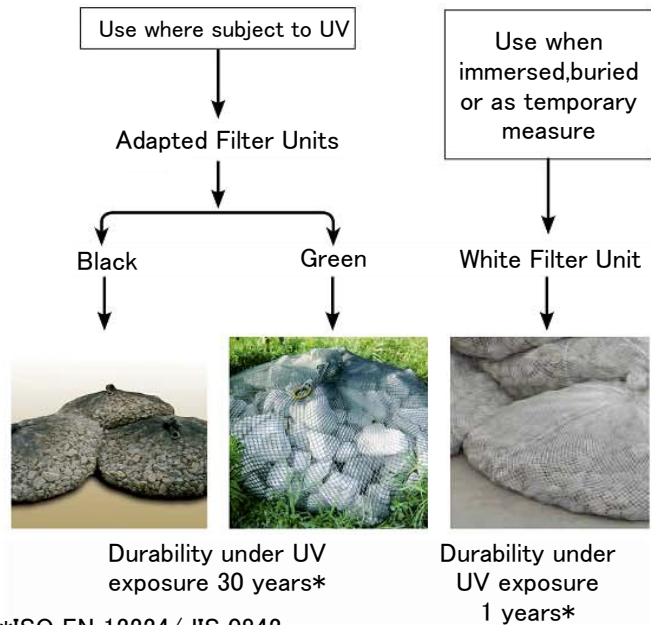
- Roads and other trafficked areas EN 13249
- Railways EN 13250
- Earthworks, foundations and retaining structures EN 13251
- Erosion control works (coastal protection and bank revetments) EN 13253
- Reservoirs and dams EN 13254
- Canals EN 13255
- Tunnels and underground structures EN 13256
- Solid waste disposals EN 13257

→ Its characteristics

allow it to be used for the long term in a large of various contexts

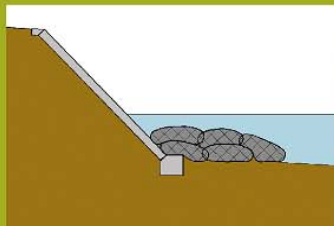
- Immersed saline environments
- Specific environments, as buried in alkali and acidic soils, and in regions of high or low temperature

→ 3 colors available

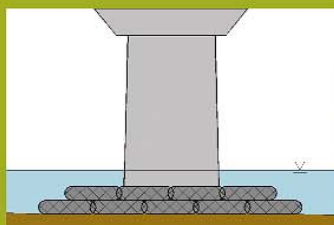


Foot works protections

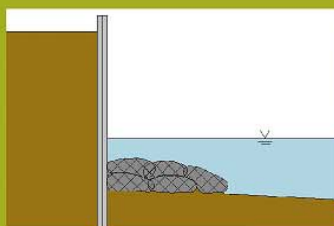
→ Bank foot protection



→ Bridge foundations



→ Quay feet protection



METHOD OF EXECUTION

→ Filling

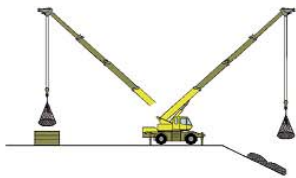


Filling materials

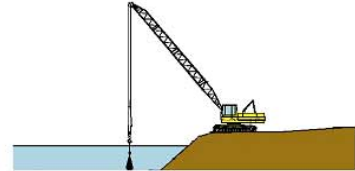
The **Filter Units** are filled, in a caisson, using any type of solid material: stones, pebbles, rubble, crushed concrete, coal, etc.

Procedure for filling

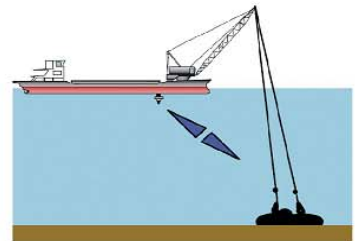
- Install the **Filter Unit** in the caisson
- Fill with material
- Close up the FU and attach the ring
- Lift off the caisson
- Lift the **Filter Unit** using the ring, and place in position



→ Placing in position

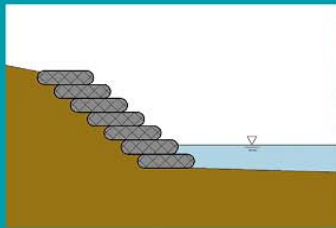


Highly maneuverable, **Filter Units** can be used easily and quickly, allowing for very rapid speed of positioning. This speed of execution significantly lowers costs of installation and labor.

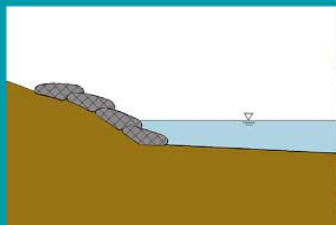


Protection for banks

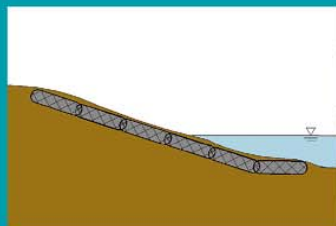
→ Protection for banks—using vertical piling



→ Protection for banks—using overlapping piling



→ Protection for banks—using flat placing



ACCESSORIES

→ Ring

Each **Filter Unit** is supplied with a cast-iron ring which connects the 6 fastening points of the net lifting rope. This ring ensures that the Unit is extremely easy to place in position, and also makes it possible to link nets together using a rope.



→ Caisson

The **Filter Unit** are filled using a caisson (to be constructed by the client). This pre-dimensioned caisson serves too as filling measure.



Miscellaneous

→ Emergency measures



→ Temporary installations



→ Beach erosion protection



PRODUCT SPECIFICATIONS

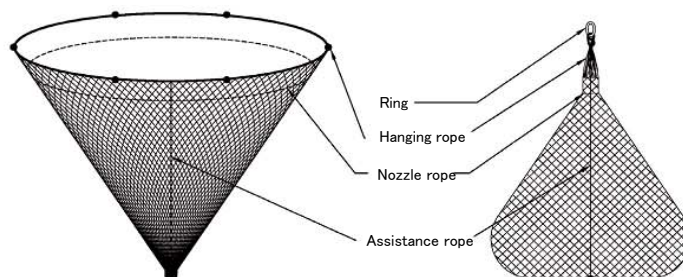


7 types of products in a range of tonnages and colors, suited for all hydraulic applications in river or maritime contexts

→ **Ecogreen type (green)** for all applications (2 tons, 4 tons), durability under UV exposure 30 years

The *Ecogreen Filter Unit* is a double net in moss-green polyester which integrates perfectly into a natural setting and along watercourses. The unique flexibility of the *Ecogreen Filter Unit*, together with its ease of use, enable it to marry up perfectly into any type of space where construction is required, particularly since the interstices provided by its filler material encourage the creation of ecosystems and rapid re-growth of vegetation.

An ecological product, manufactured using recycled plastic bottles, the *Ecogreen Filter Unit* has achieved the "Ecomark" ecological labeling awarded to products acknowledged as being useful in protecting the environment by the Japan Environment Association <http://www.ecomark.jp>



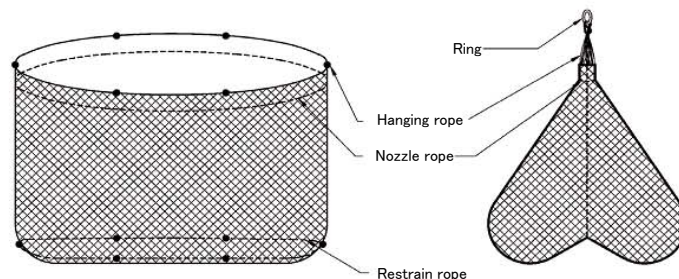
Technical specifications									
Ecogreen	Mesh size	Unit weight, FU empty	Dimensions in meters, FU installed				Resistance* to currents without being moved		Recommended granulometry of the stuffing material
			Height	Diameter	Surface(m ²)	Vol(m ³)	Unit	Grouped	
2 tons	25mm	6kg	0.4	1.9	2.8	1.24	3.1m/s	4.7m./s	50~200mm
4 tons	25mm	13kg	0.6	2.4	4.5	2.5	3.5m/s	5.3m/s	50~200mm

*Safety margin/weight= × 1.5 included

→ **S type (black/white)** for maritime applications (4 and 6 tons black/white, 8 tons white), durability under UV exposure Black/White 30 years/1 year

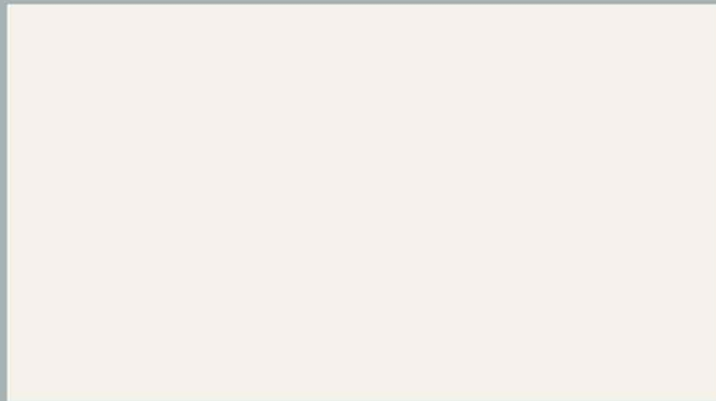
Specifically adapted to extreme conditions and to marine environments*, with double weaving and a restrain rope which assists in reducing rubbing from the contents, and thus wear to the net, by around 30%.

*Depending on the context



Technical specifications									
Ecogreen	Mesh size	Unit weight, FU empty	Dimensions in meters, FU installed				Resistance* to currents without being moved		Recommended granulometry of the stuffing material
			Height	Diameter	Surface(m ²)	Vol(m ³)	Unit	Grouped	
4 tons	50mm	15kg	0.6	2.4	4.5	2.5	3.5m/s	5.3m./s	75~200mm
6 tons	50mm	29kg	0.65	2.85	6.4	3.7	3.7m/s	5.6m/s	75~200mm
8 tons	50mm	40kg	0.7	3	7	5	3.9m/s	5.9m/s	75~200mm

*Safety margin/weight= × 1.5 included



www.kyowa-filterunit.com



Manufacturer

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