



Geomembrane production

Latest technologies, market trends and applications

BANDERA
EXTRUSION INTELLIGENCE®



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Bandera history



1947

Costruzioni
Meccaniche Luigi
Bandera officially
started operating

1950

the company
turned into a joint
stock company

1960/70

between 1960
and 1970 the
activities
expanded to an
industrial scale

1980/90

through 1980s
and 1990s the
company became
an acknowledged
leader
among the
extrusion
equipment
manufacturers

now

Bandera, currently
managed by
Franco and Piero,
the founder's sons,
has recently
focussed its
product range on

- blown film
extrusion lines
(packaging/
converting/agrifilm)
- flat die extrusion
technology for rigid
thin films and thick
sheets



The House of Extrusion®



Bandera brand **new centre housing R&D** activities and wet tests on complete production lines
Newly opened in May 2015, it is the result of a 4 million Euro investment





In-house manufacturing of extrusion system main component parts, thus ensuring **top quality** and making spare parts readily available – even for non-standard machinery

Over the years, Bandera has acquired **in-depth knowledge of thermoplastic rheology**, resulting in state-of-the-art finished products

Digital **simulation and** design allow a pre-project check on any system performance



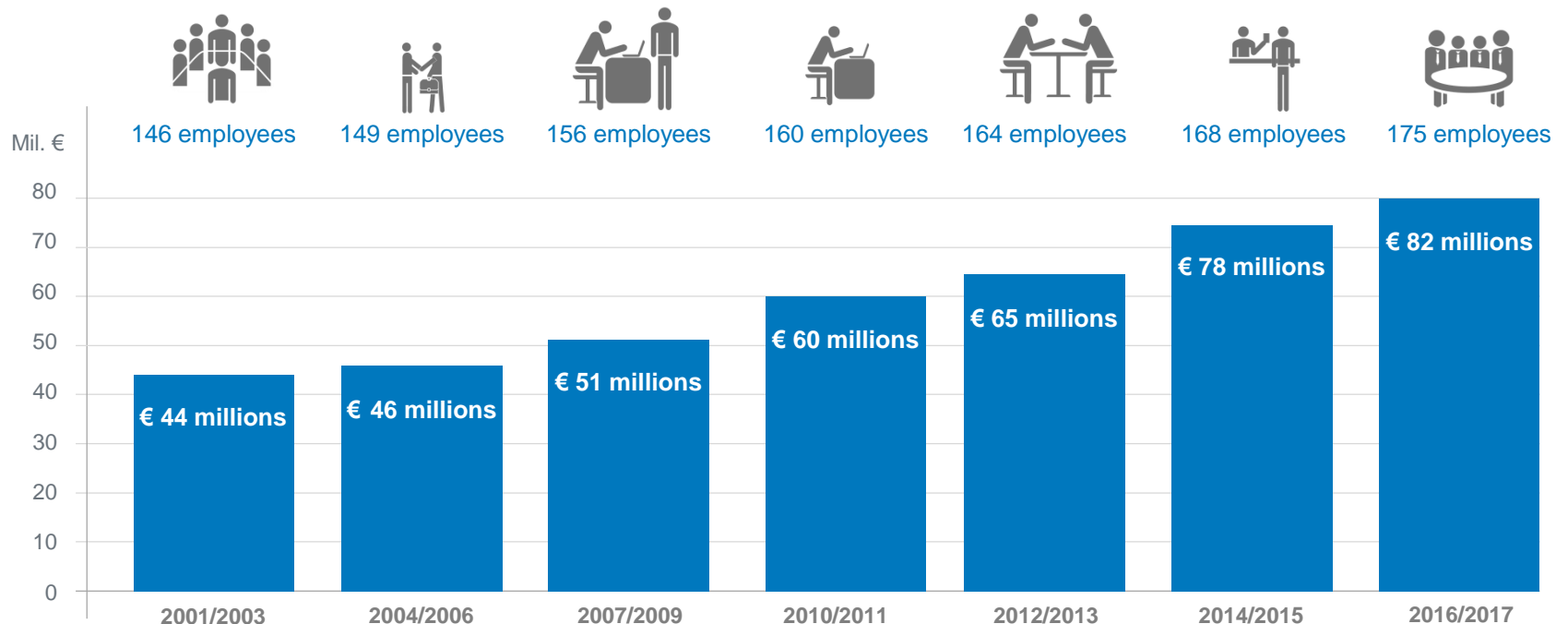
Facts and figures



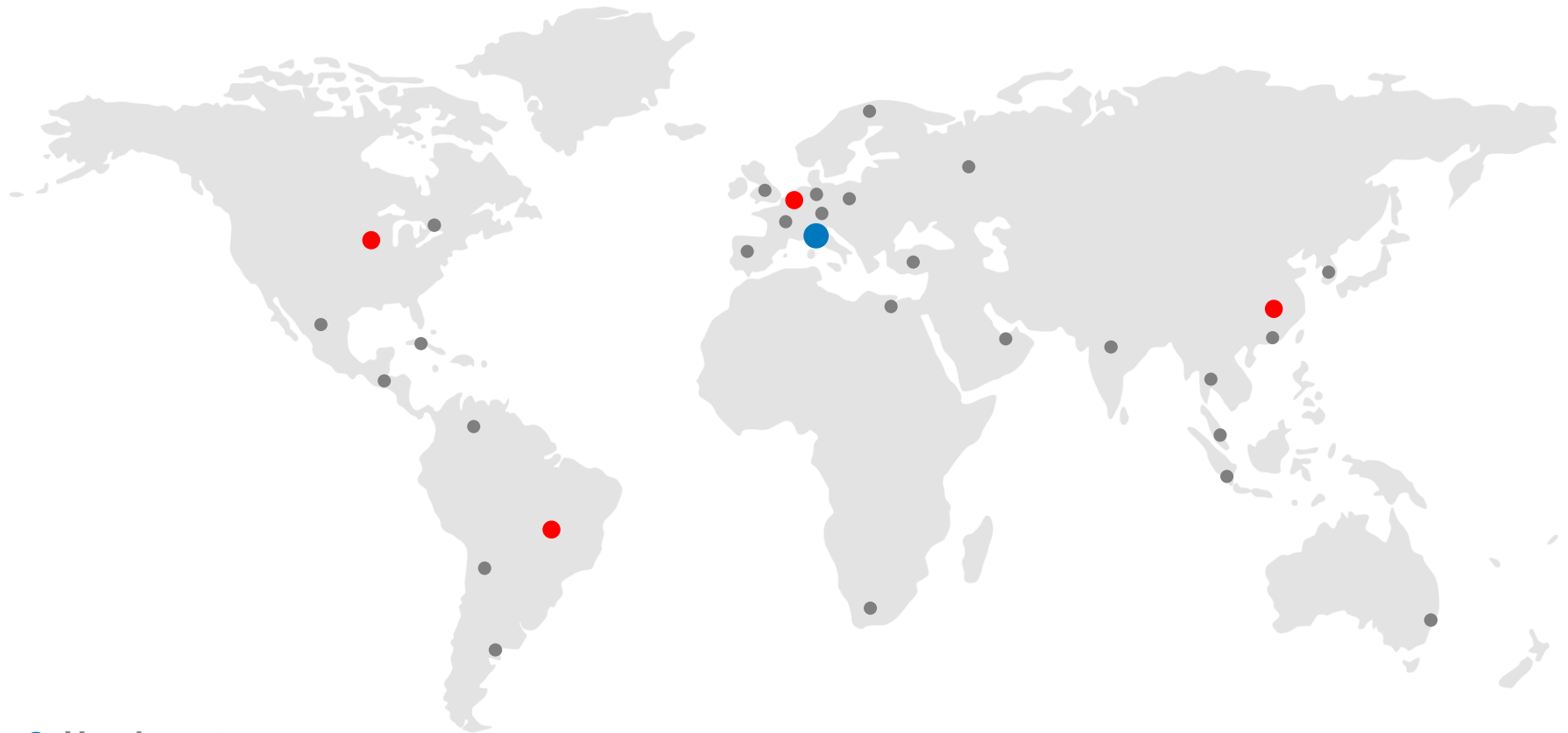
Since the very beginning, Bandera has always had a **solid financial basis**

Considering the number of employees and the sales revenue, Bandera is the **biggest** extrusion systems manufacturer in Italy and a **leading company** at a worldwide level

In the last few years not only has the company significantly **increased** the number of **specialised technicians** – mainly engineers working on design and support – but **the business has also grown substantially** on a global scale



Bandera, local and global at a time



- Headquarters
- Service centres
- Sales exclusive offices

Source: internal data as of December 2015

After sales service



Bandera relies upon a dedicated **team** of top class technicians specialised in complete production line **installation**, **start-up** and **customer staff training**

A **responsive and efficient customer service** is one of the essential strengths of a global business dealing with complete production lines located throughout the world

A **global network** and a capillary presence worldwide through Bandera sales offices and exclusive representatives all over the world

Thanks to its **IoE – Internet of Extrusion®** – proprietary technical service system, Bandera is able to have a truly global reach



Product line shares



Plants for
blown film
lines



Plants for
rigid film
and sheet
lines



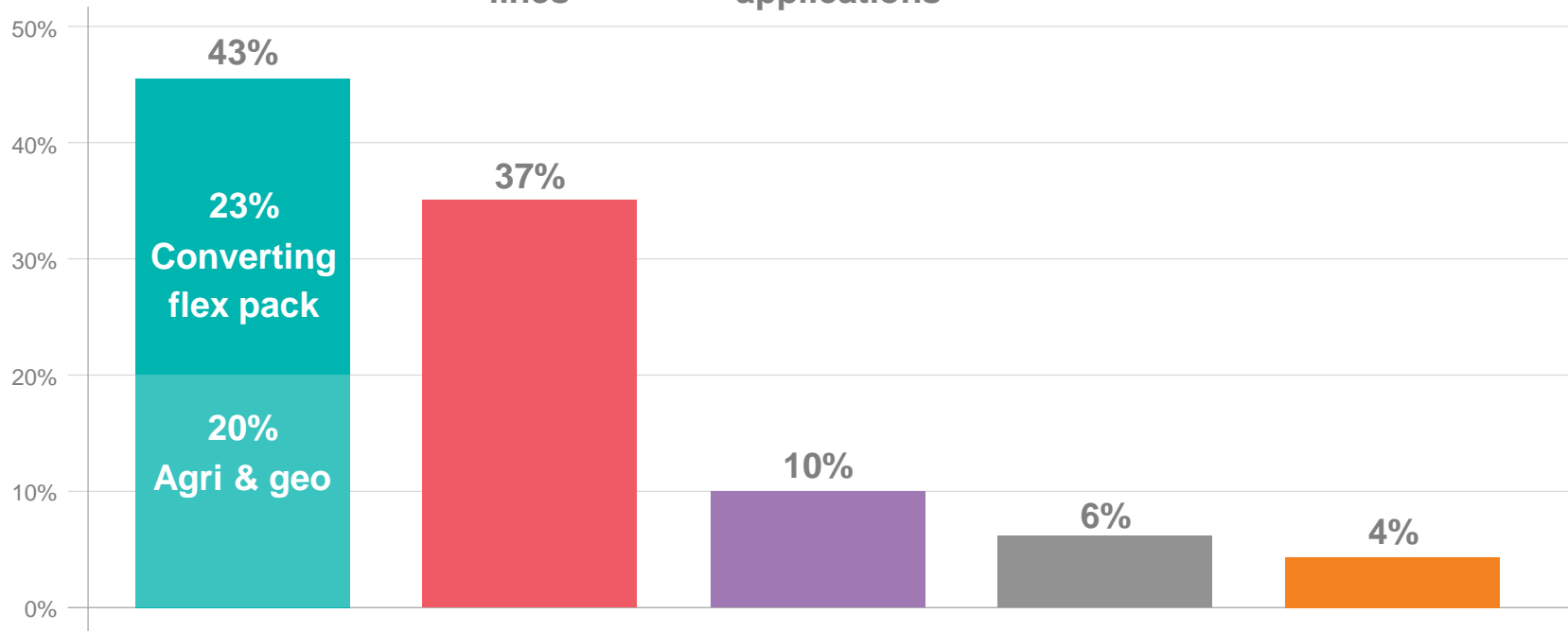
Single
extruders
for special
applications



Spare
parts



PVC
Pelletizing



Source: internal data as of December 2015



**Bandera is a worldwide leader
in the production of complete multilayer
blown film big plants
dedicated to geomembrane and agricultural film**





Function

To work as a durable containment liner or cover in a specific system, to prevent gas or liquids migration



Properties

These are required to be waterproof, chemically inert, non-porous and barrier



Wide variety of geomembrane applications



Beneath asphalt overlays as a waterproofing layer

Liners for radioactive or hazardous waste liquid

As covers for aerobic and anaerobic manure digesters in the agriculture industry

Aqua culture **Canal and reservoir lining**

As liners for waste liquids (e.g., sewage sludge)

To control expansive soils

As waterproofing liners within tunnels and pipelines

To form barrier tubes as dams

As waterproof facing of earth and rockfill dams

Tank lining *ponds for fish farming*

As liners for brine solutions

As linings for emergency spillways

To contain and transport liquids in trucks

As a barrier to odors from landfills

As waterproof facing for roller compacted concrete dams

As liners for golf course water holes and sand bunkers

As floating reservoirs for seepage control

As covers for power plant coal ash

Canal and reservoir lining *To control frost-susceptible soils*

To face structural supports as temporary

cofferdams **Tunnel liners / lining**

To conduct water flow

into preferred paths

As liners for all types of decorative and architectural ponds

To prevent infiltration of water in sensitive areas

As liners for secondary containment of underground storage tanks

As liners for potable water

As liners/covers solid-waste landfills and waste piles

To shield sinkhole-susceptible areas from flowing water

Beneath and adjacent to highways to capture hazardous liquid spills

As a barrier to vapors (radon, hydrocarbons, etc.) beneath buildings

As containment structures for temporary surcharges

As waterproof facing for masonry and concrete dams

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As liners for vertical walls: single or double with leak detection

As cutoffs within zoned earth dams for seepage control

To contain seepage losses in existing above-ground tanks

**Current priorities
in India**

water management

food

pollution

infrastructures

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Water management





Food





Pollution





Infrastructures





Extrusion technologies for geomembranes



Flat die technology



Blown film technology



Geomembrane production technologies

2/2



	Membrane mechanical properties	Membrane thickness tolerances	Machine flexibility (thickness & width adjustment)	Membrane customisation possibilities	Output	Investment	Logistic implications
Flat die technology							
Blown film technology							



Sheet extrusion lines for geomembranes

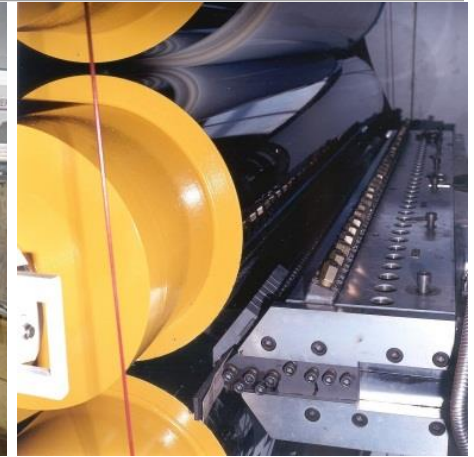
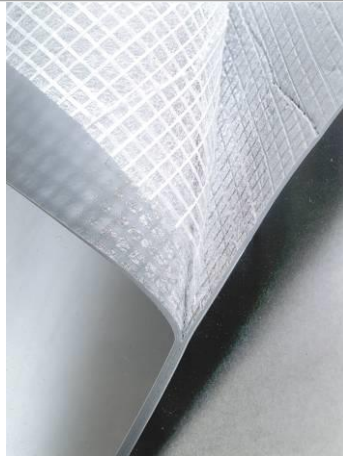
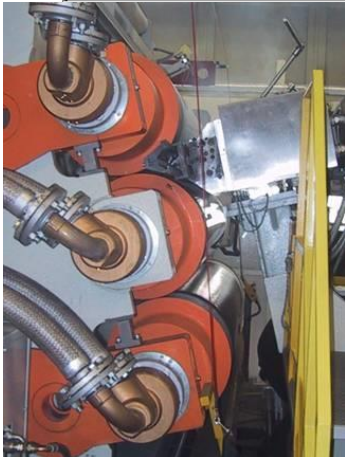
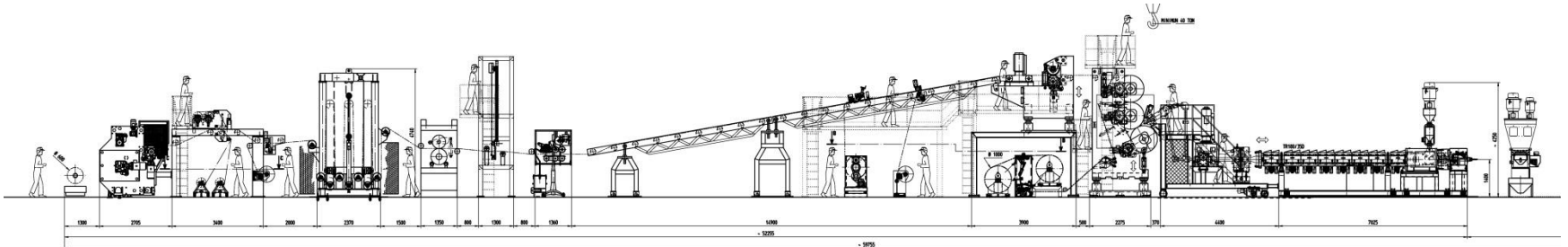
High throughput (up to 2500 Kg/h) and total flexibility (enhanced mixing and self-cleaning properties). For these reasons, twin screw co-rotating extrusion technology or specially engineered single screw extruders are usually selected





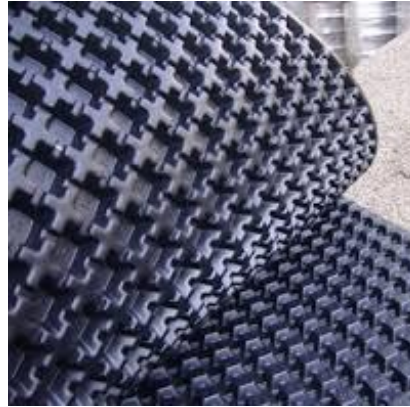
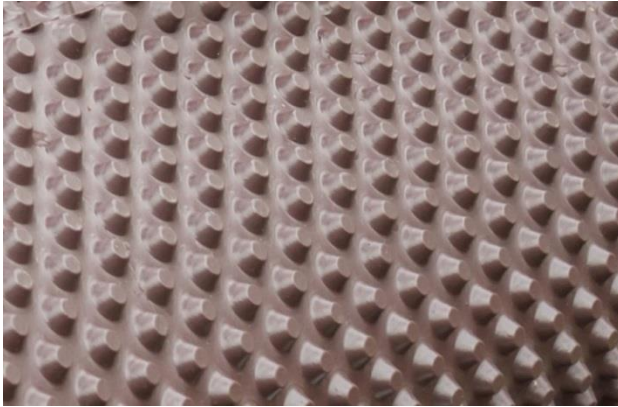
Sheet extrusion lines for geomembranes

Special projects, our daily job

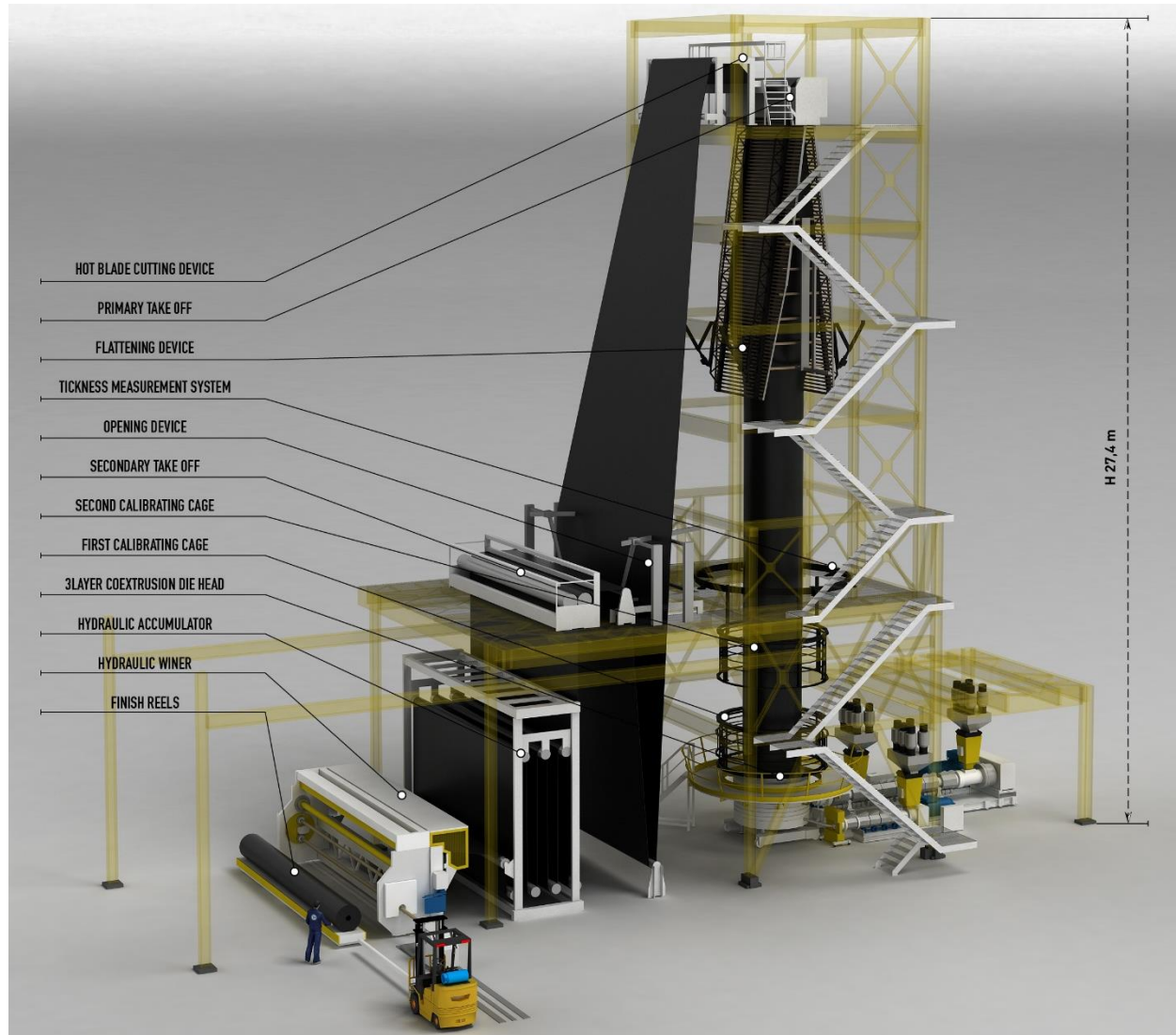




Examples of different surface patterns



Blown film technology, Bandera solution 1/4



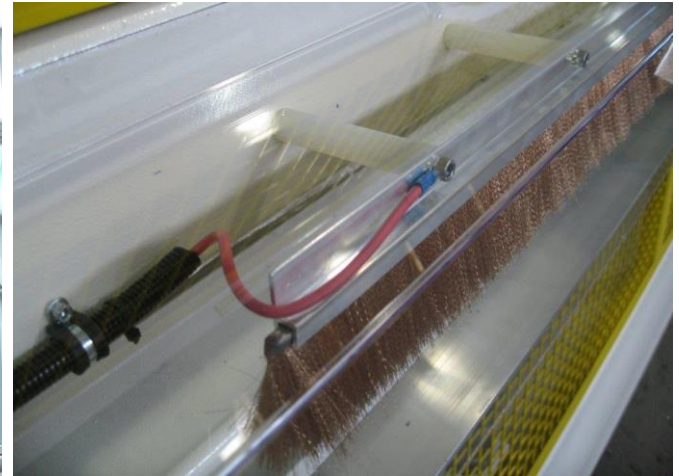
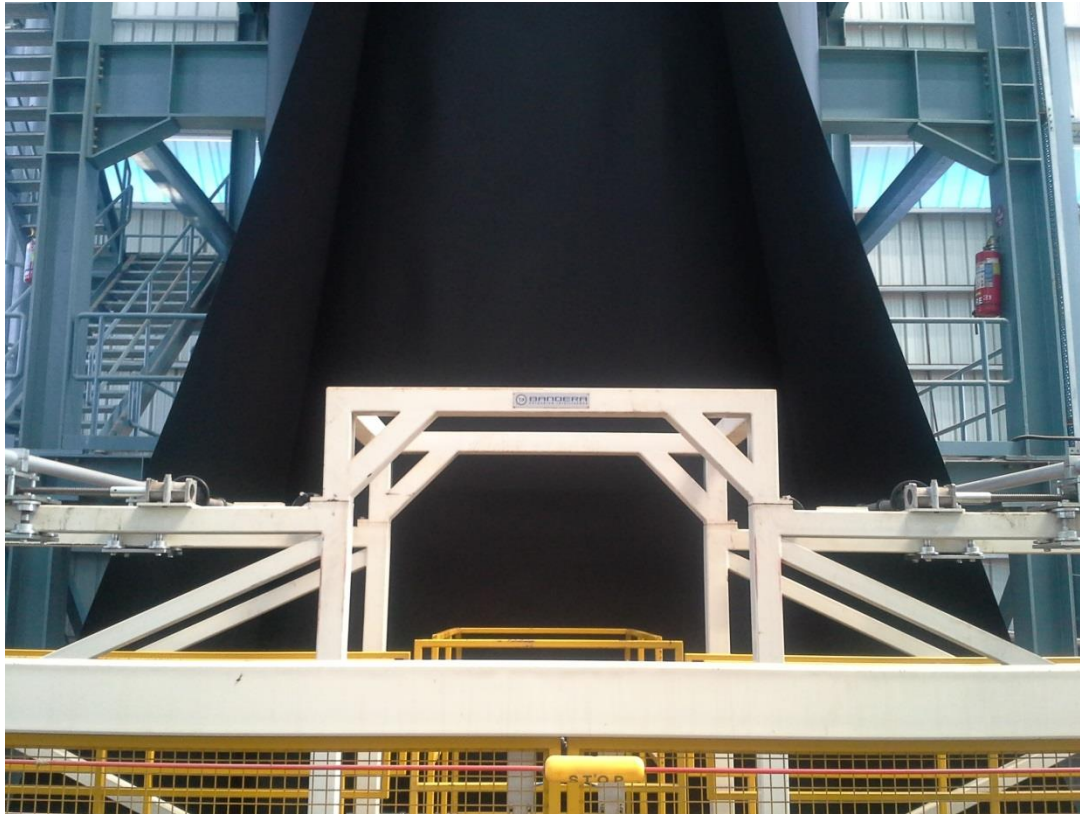


Extrusion die-head



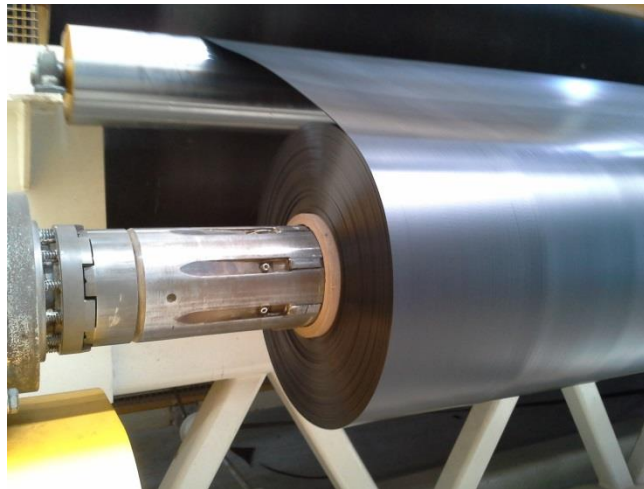
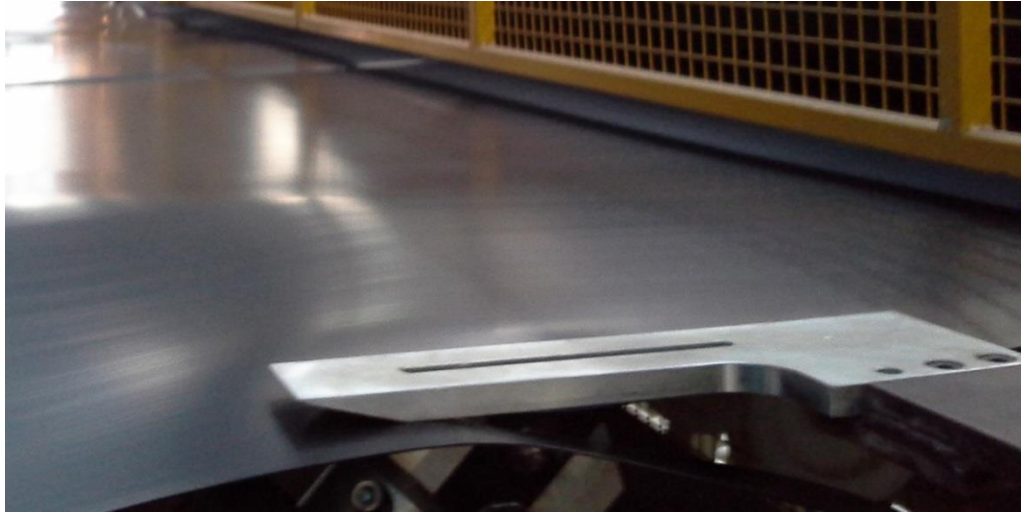


Opening device, hole detector and accumulator





Cutting edge trim, rewinder and finished rolls





Two possible production sizes



5,8 m for export,
to fit into 20 feet container



8 m for local markets,
to reduce the number of weldings
on the field

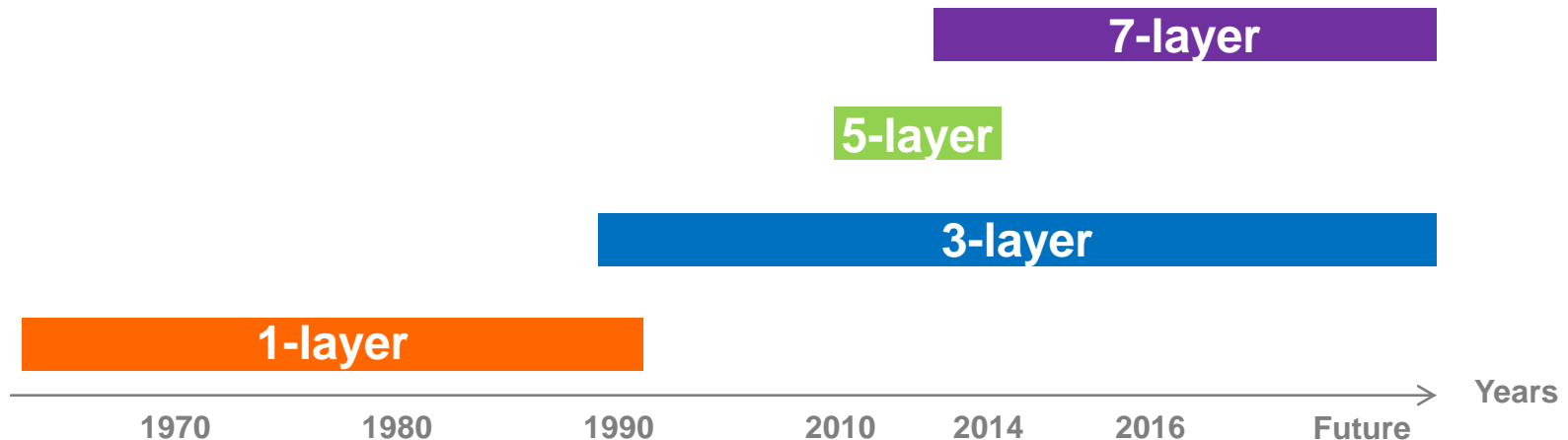
5,8 m

8 m



A Increasing number of layers

To achieve **wide choice on raw material formulation**
and optimising production costs



B Continuous research for improving performances



Geomembrane surface should have the possibility to:

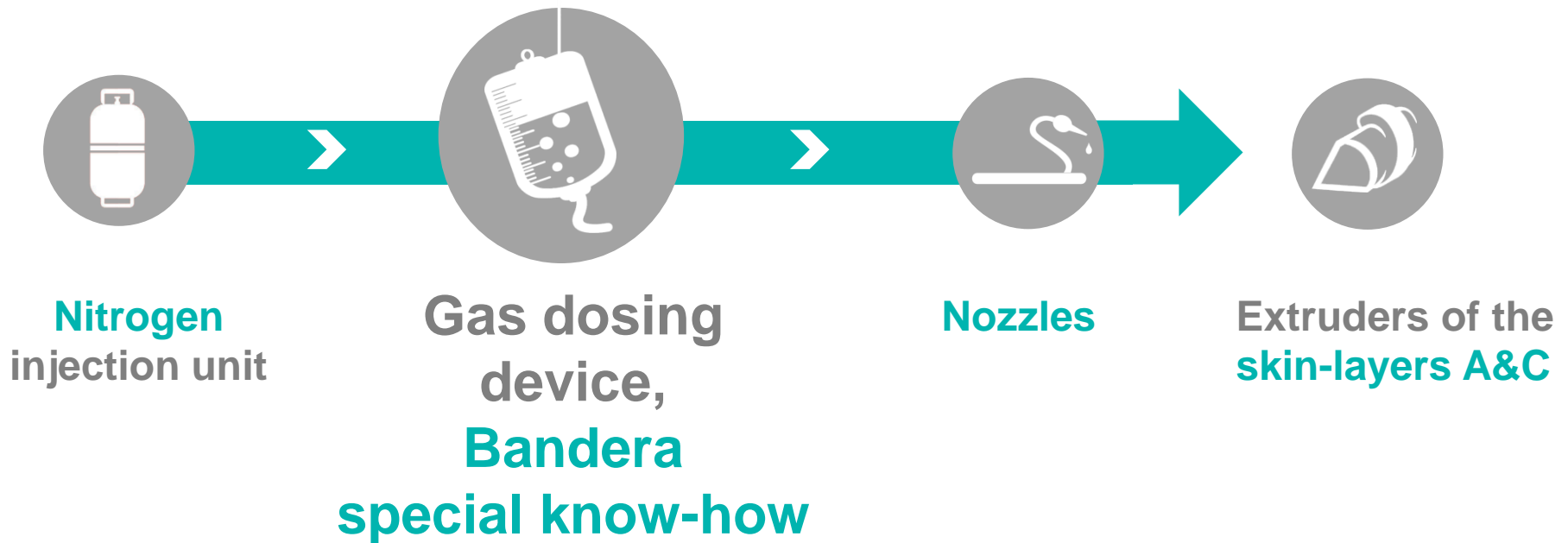
- be **smooth**
- be texturized (one side or both sides)
- have adjustable texture roughness
- go with **smooth stripe** for enhancing in-field welding operation



Example of different roughness



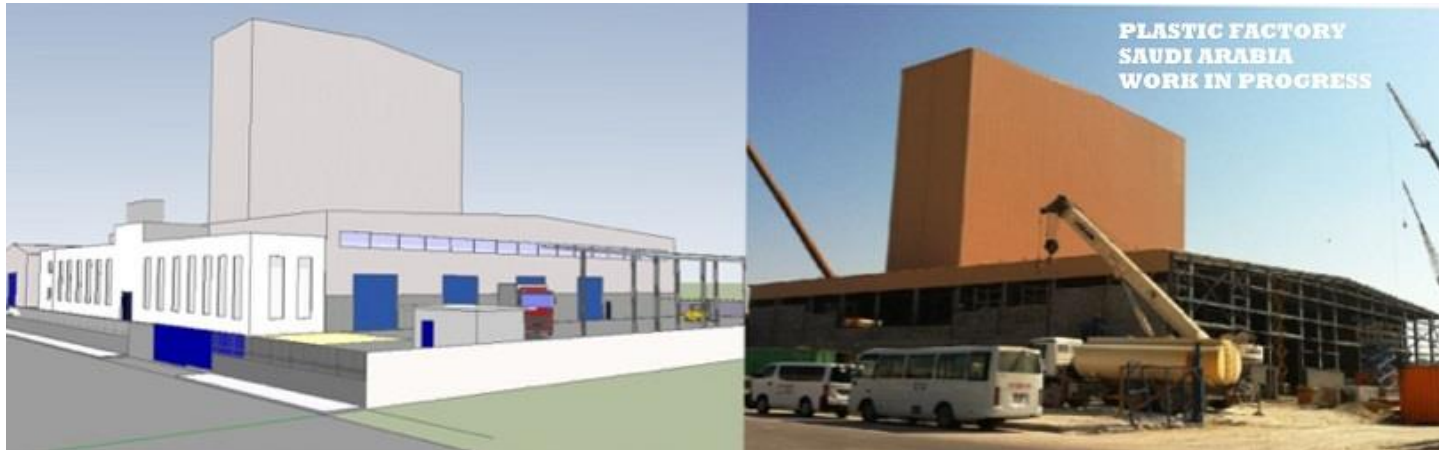
Bandera innovation for nitrogen injection





Bandera delivers turn-key projects, thanks to its long-term expertise and know-how

Besides engineering and manufacturing agricultural film lines,
Bandera's technical department is skilled and experienced to
provide a top level consultancy service:
projecting the factory hosting the plant itself





Agrifilm production can be processed with the same extrusion head used for Geomembrane

Agrifilm target market growth is ongoing, especially in emerging economies

With a dedicated downstream it is possible to run wide film (16 – 22 m) suitable for the production of greenhouses covers

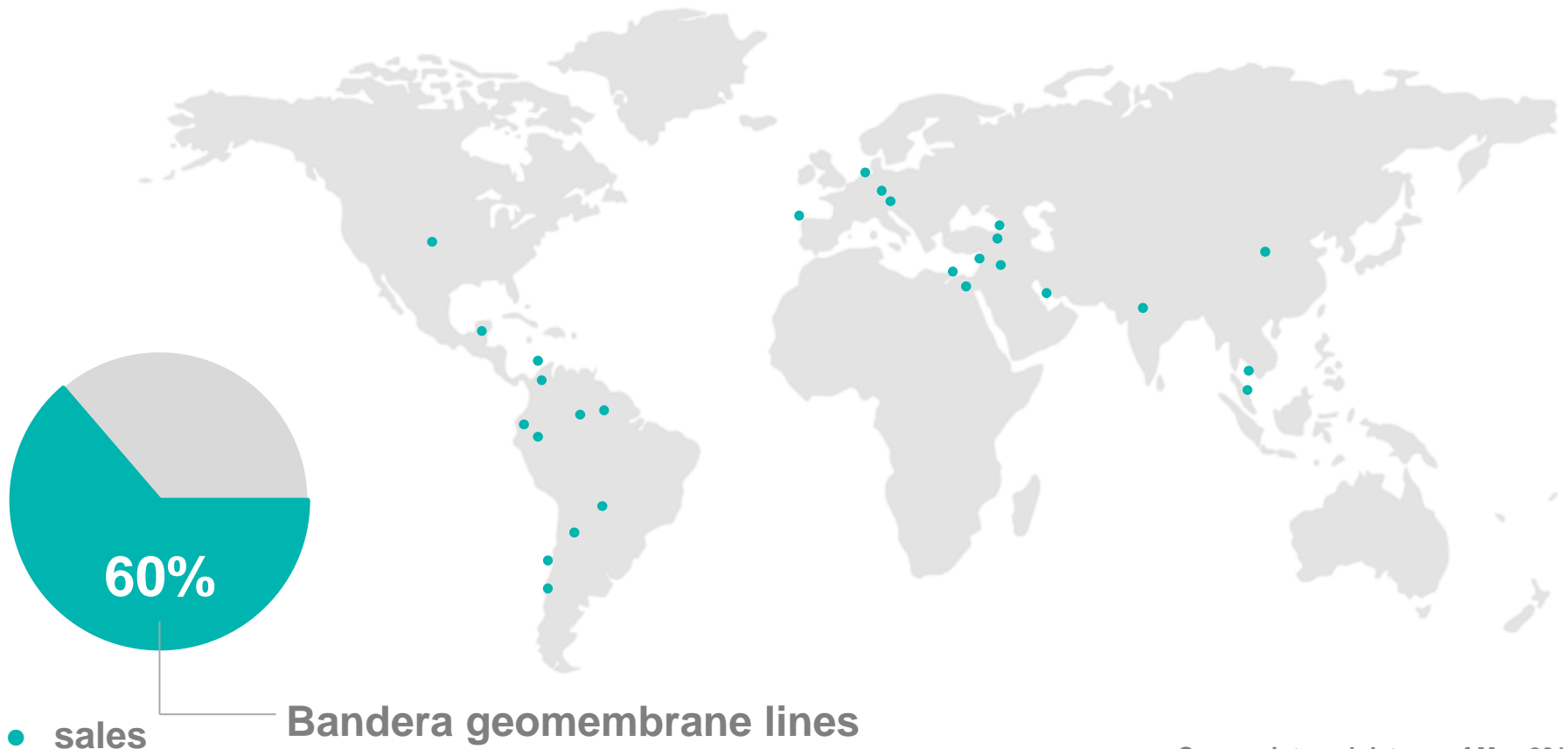
Output around 2 tons/h



Geomembrane customers



Over the last 10 years **Bandera** has sold worldwide about **60%** of the total amount of geomembrane lines for the production of 7÷8 m width film



Source: internal data as of May 2016

Thank you



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