

# Recyclable High Barrier Mono Material Pouches for Flexible Packaging

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# The alternative approaches.



"Circular Economy Package": 100% of plastic packaging must be reusable or recyclable by 2030.



Germany: 63% within 2022-Verpackungsgesetz 2017).



India: ban to single use plastic by 2022.



India and China: ban to waste plastic import from abroad to recycle into new products.



# Approaches to More Sustainable Packaging.

- A) Recyclability** mainly obtained from mono-material packaging or from easy layer separation into chemically homogeneous fractions.
  - With the consequent use of significant and growing quantity of recycled material to feed the production line.
- B) Biodegradable** materials are a choice despite all the relevant limitation in terms of properties and durability.
- C) Replacement** of plastics with paper-based substrates on selected applications.



# The Three-Ply Compound.

Ply Sequence	Function	Materials	Properties
1	Printed web	Paper, Pet , Bopp, OPA.	Gloss or Matt Heat resistance Stiffness
2	Barrier web	Aluminum foil, met-Pet, AlOx-Pet, SiOx-Pet, met-OPA.	Protection from Light, Oxygen; Water Barrier
3	Sealant web	LDPE, CPP.	Heat seal ability



# The Alternative.

All Polyolephine		
Ply Sequence	Function	Materials
1	Printed web	BOPP
2	Barrier web	MET-BOPP
3	Sealant web	LDPE.

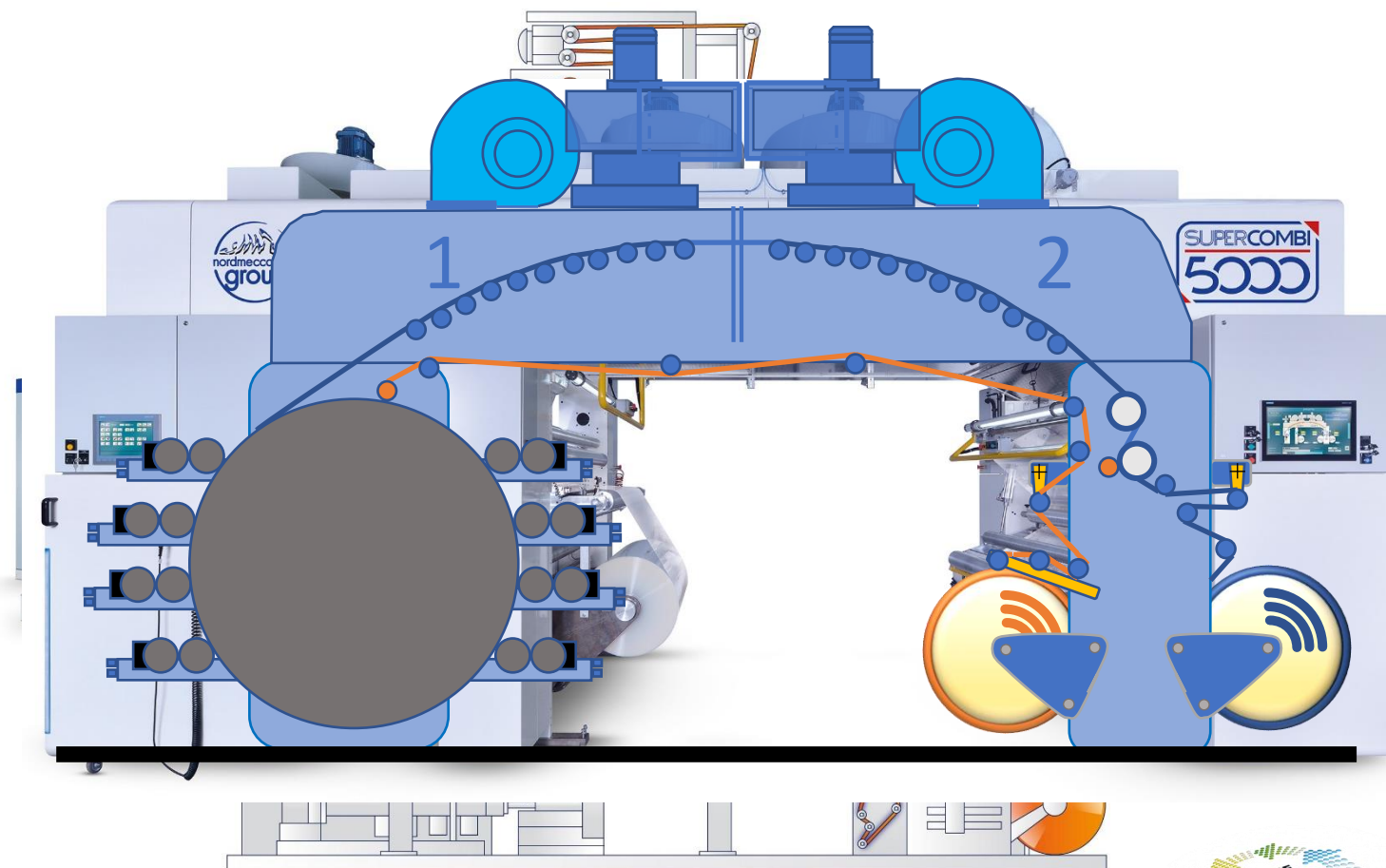
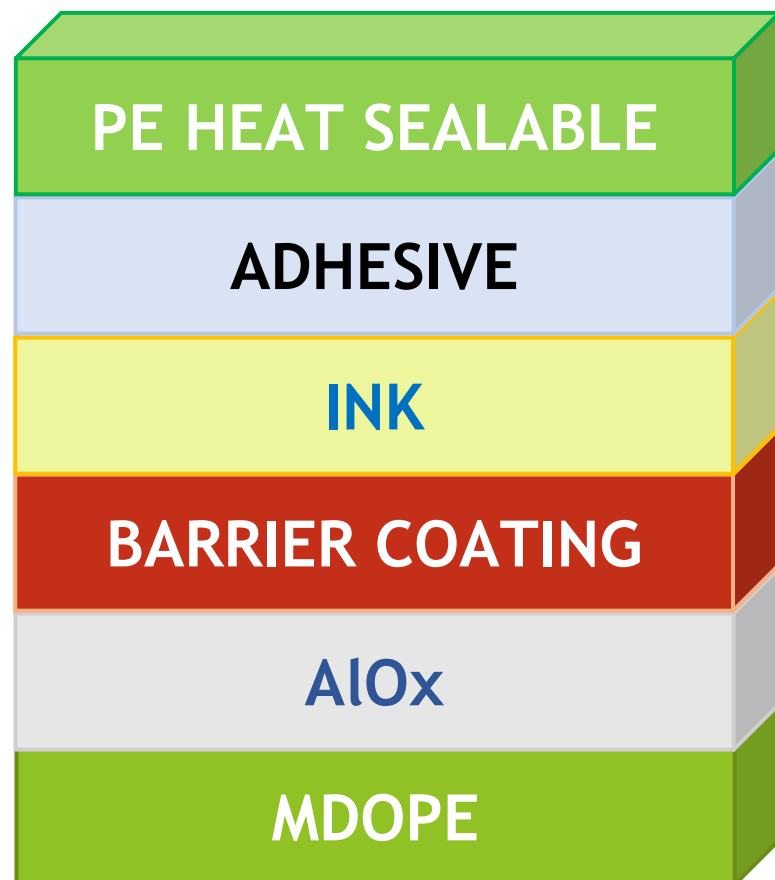
All Polypropylene		
Ply Sequence	Function	Materials
1	Printed web	BOPP
2	Barrier web	MET-BOPP
3	Sealant web	CPP

The All-PE.

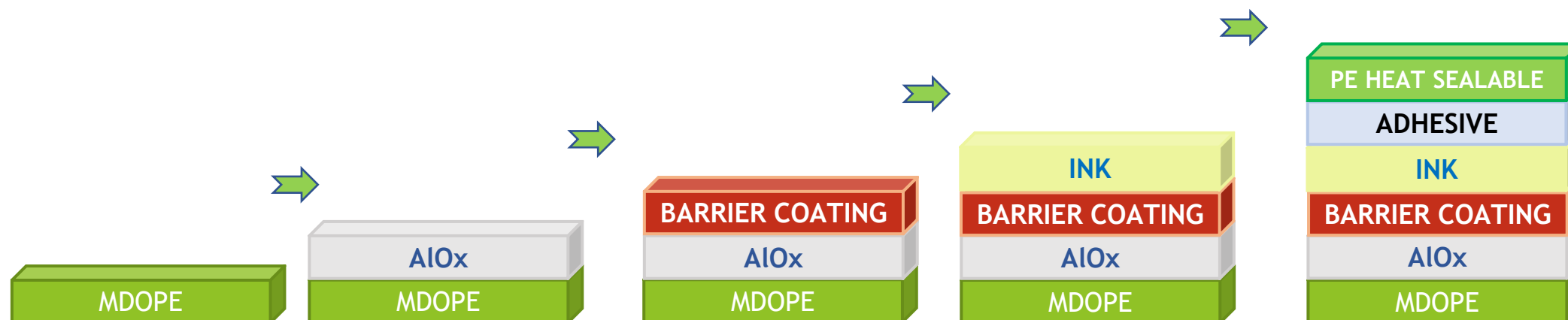
**100%**  
recyclable  
**M**  **NO**  
**MATERIAL**



# The All-PE.



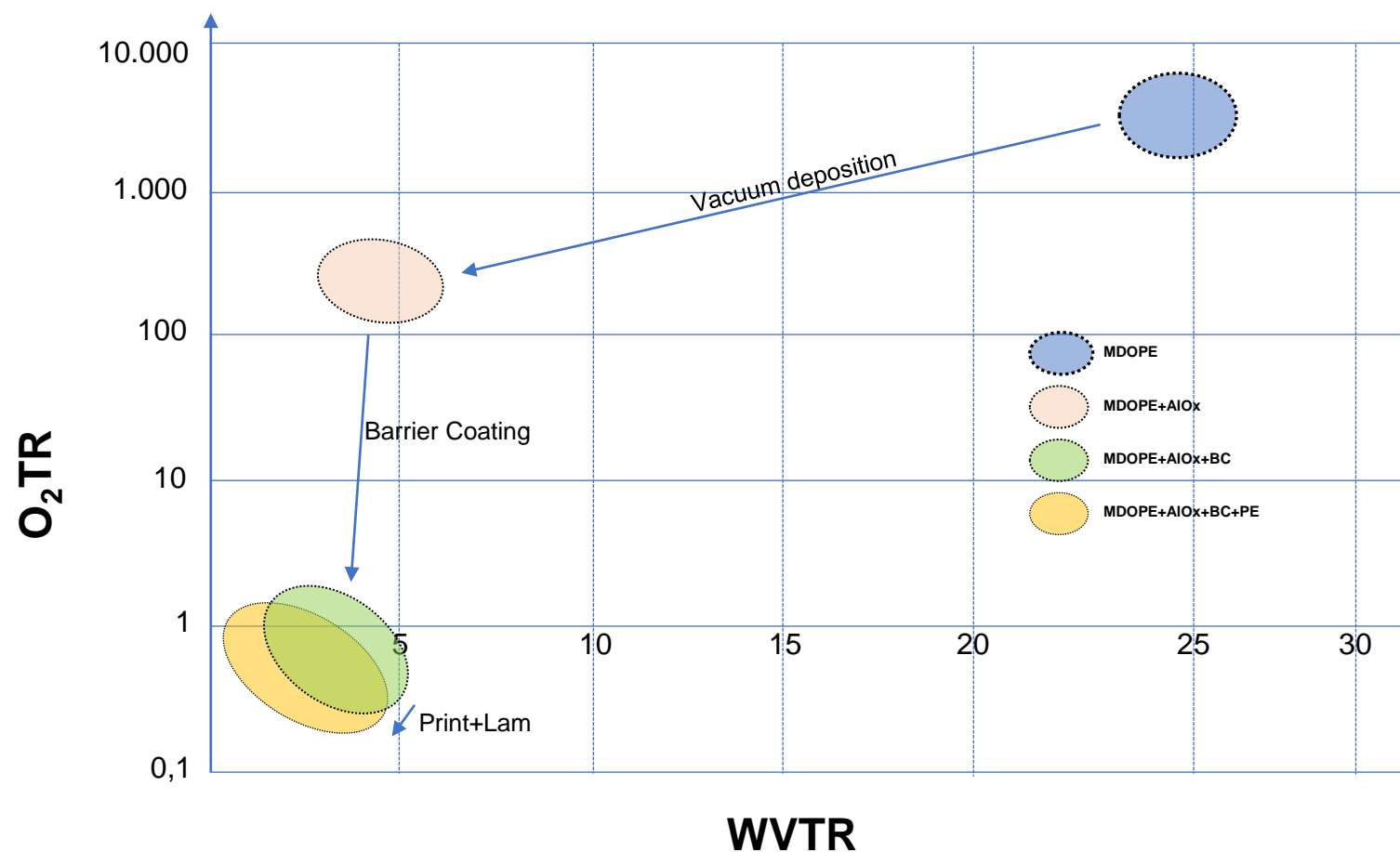
# The Mono-Material Pathway



Thickness (μ)	<b>25</b>	<b>25+0.01</b>	<b>25 + 0.01 + 0.5</b>	<b>25 + 0.01 + 0.5 + 1</b>	<b>25 + 0.01 + 0.5 + 1 + 1.5 + 50</b>
O2TR (*)	3000-4000	150 - 400	0.2	0.2	0,3
WVTR (*)	7-10	< 5	< 5	< 5	1-3
% PE	100	99	98	94	96

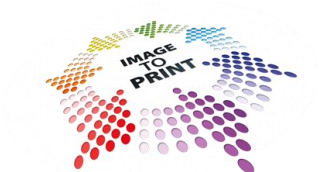


# The Mono-Material Pathway.



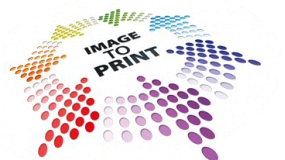
# Industrial Application.

- Polyethylene films are being produced and used in thousands of Tons for multiple applications and, considering the circular economy demand, the PE recycling streams are existing and well established.
- Production lines for PE, blown or cast, are virtually everywhere and can be installed with a reasonable investment.
- The MD orientation units can be installed on most blown film lines as modular addition: they improve the film mechanical, thermal and optical characteristics.
- MDO-PE can be vacuum metallized, coated, printed and laminated with superior efficiency and performance in terms of barrier, printability, stability in bag making etc.



# Challenges of the All-PE solution.

- The MDO-PE quality and properties need to be designed and tailored for the demanding processes and application requirement: Polymer formulation, surface properties, integrity from defects and roll formation quality need to be optimized. There is a lot to do to achieve film properties consist with high performance.
- The results of three years trials demonstrate the technical feasibility of a mono-material packaging for multi-layer and multi-material replacement: additional R&D and testing is ongoing to confirm consistency of results.
- The industrial production of mono-material alternative can be possibly more expensive than existing products: this issue will be necessarily addressed in the framework of the general policy driving the shift to a more sustainable packaging business; however, efforts are needed to optimize the material, coating and process costs.



# From Concept to Action.

