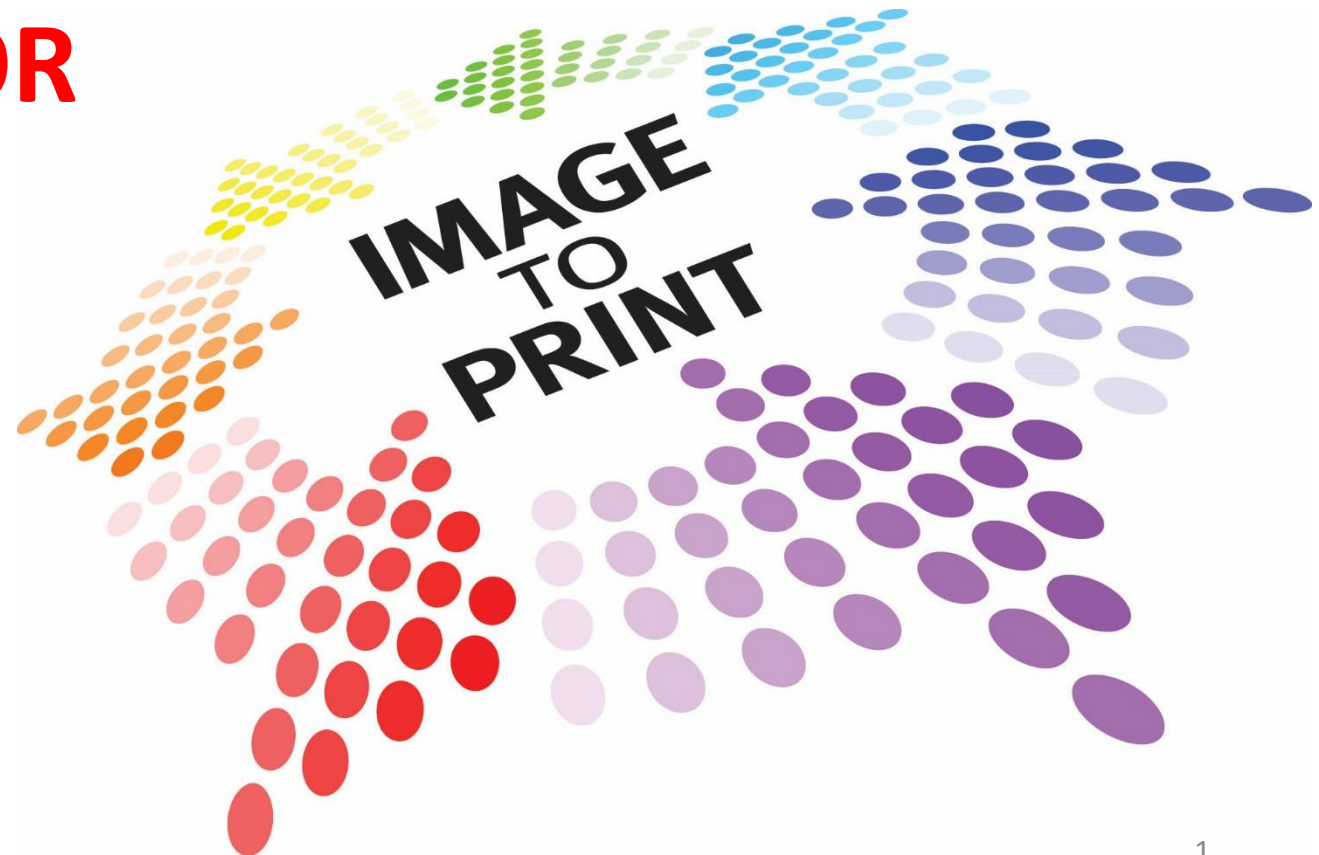


PRINTING TECHNOLOGY & INNOVATION DAYS FOR FLEXIBLE PACKAGING

20 / 21 November 2019
Kuala Lumpur, Malaysia



PRINTING TECHNOLOGY & INNOVATION DAYS FOR FLEXIBLE PACKAGING

HOSTED BY:

janoschka



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A STEP IN THE NEW WORLD OF METALLIZATION

FABIO VINCENZI

**Commercial Director Vacuum Division,
NORDMECCANICA group**



The Role of Vacuum Coating in the quest of more sustainable Flexible Packaging

INTRODUCTION

SUSTAINABILITY IN FLEXIBLE PACKAGING

TRENDS IN VACUUM COATED POLYMERS

NEW SOLUTIONS AND FUTURE DEVELOPMENTS

WORK IN PROGRESS & CONCLUSIONS



PLASTIC WASTE MANAGEMENT , CIRCULAR ECONOMY, SUSTAINABLE PACKAGING INDUSTRY : A MULTIPLE LEVEL APPROACH

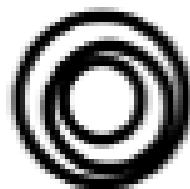
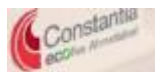
NATIONAL/INTERNATIONAL
LEGISLATION

INTERNATIONAL
VOLUNTARY
ASSOCIATIONS

BRAND OWNER, FOOD
PACKAGING INDUSTRY,
CONVERTER AND
CHEMICAL SUPPLIER



**NEW
PLASTICS
ECONOMY**



ELLEN
MACARTHUR
FOUNDATION



Moving up the waste hierarchy



A EUROPEAN STRATEGY
FOR PLASTICS
IN A CIRCULAR ECONOMY



**EXAMPLE : EU-COMMISSION
BINDING TARGET FOR ALL
MEMBER STATES (Circular
Economy package issued in 2015
and confirmed in 2017)**

**VOLUNTARY PUBLIC
COMMITMENTS FROM STATES;
INSTITUTION; INDUSTRY :**



**ALL PLASTIC PACKAGING
RECYCLABLE OR RE-
USABLE WITHIN 2030**



25% post-consumer recycled
content target across all
plastic packaging used by 2025

Take action to move from single-
use towards reuse models
where relevant by 2025:

100% of plastic packaging to be
reusable, recyclable, or
compostable by 2025:

Take action to eliminate
problematic or unnecessary
plastic
packaging by 2025:



RECYCLABLE MATERIALS FROM DESIGN



All package recyclable by 2025



All package recyclable by 2025



Separation of liquid container parts for different recycling streams



Opening (2019) Indian facility fully dedicated at single material (PE) packaging



Launched the «Blueloop» platform to produce single material packaging of Paper, PP or PE



Launched the really fully recyclable pouch already in 2019.
Commitment to 100% recyclable production



Amcor signed the «New Plastic Economy commitment, declaring to have achieved high performance all polyolefine package



RECYCLABLE MATERIALS FROM DESIGN

or

RECYCLED MATERIAL CONTENT

TOPPAN

TOPPAN PRINTING announced a single material Pet approach to recyclability developing also a pet based sealant; and very recently (Sept 2019) a line of clear barrier PP and clear barrier PE



UFLEX won the 2019 Aimcal Sustainability award for its all-Pet barrier film containing 90% of post-consumer recycled material ("PCR").

From these examples and many other cases we can summarize the approach to more sustainable packaging, following three directions :

- Recyclability mainly obtained from single material packaging or from easy layer separation into parts homogeneity
- Biodegradable materials are a choice in spite of all the relevant limitation in terms of properties and durability
- Use of significant and growing quantity of recycled material to feed the production line.

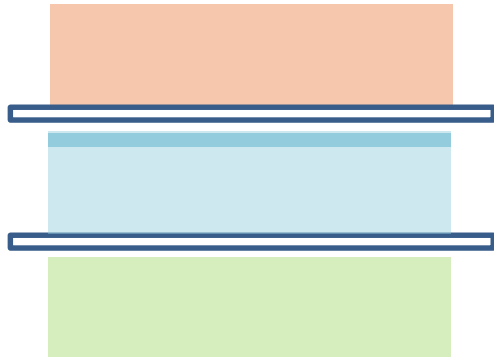


AN EXAMPLE FROM POLYOLEFINE STREAM . (source emf foundation 2018 preliminary draft)

	Preferable for recycling	Acceptable for recycling
Overall characteristics	Dimensions > 20 x 20 mm Overall density < 1 g/cm ³	Dimensions > 20 x 20 mm Overall density < 1 g/cm ³
Material choice	Mono PE or PP > 90% of total structure PVC or PET not permitted PA, ethylene copolymers, etc. limited to < 5% Multi-layer structures with aluminium and paper not permitted (to be directed to respective recycling streams)	Mix of PE and PP > 80% of total structure PVC or PET not permitted PA, ethylene copolymers, etc. limited to < 10% Multi-layer structures with aluminium and paper not permitted (to be directed to respective recycling streams)
Barrier coatings	Acrylic, EVOH, PVOH, SiOx, AlOx, metallisation limited to < 5% of total structure PVDC not permitted	Any non-halogen based coating permitted < 10% of total structure PVDC not permitted
Adhesives	Solvent-free adhesives < 5% of total structure	Any adhesives < 10% of total structure
Printing	Minimum level of print and lighter colours	Any level of print, less is better
Masterbatch	Carbon black not permitted	Carbon black not permitted



THE CLASSICAL AND FAMILIAR 3-PLY STRUCTURE



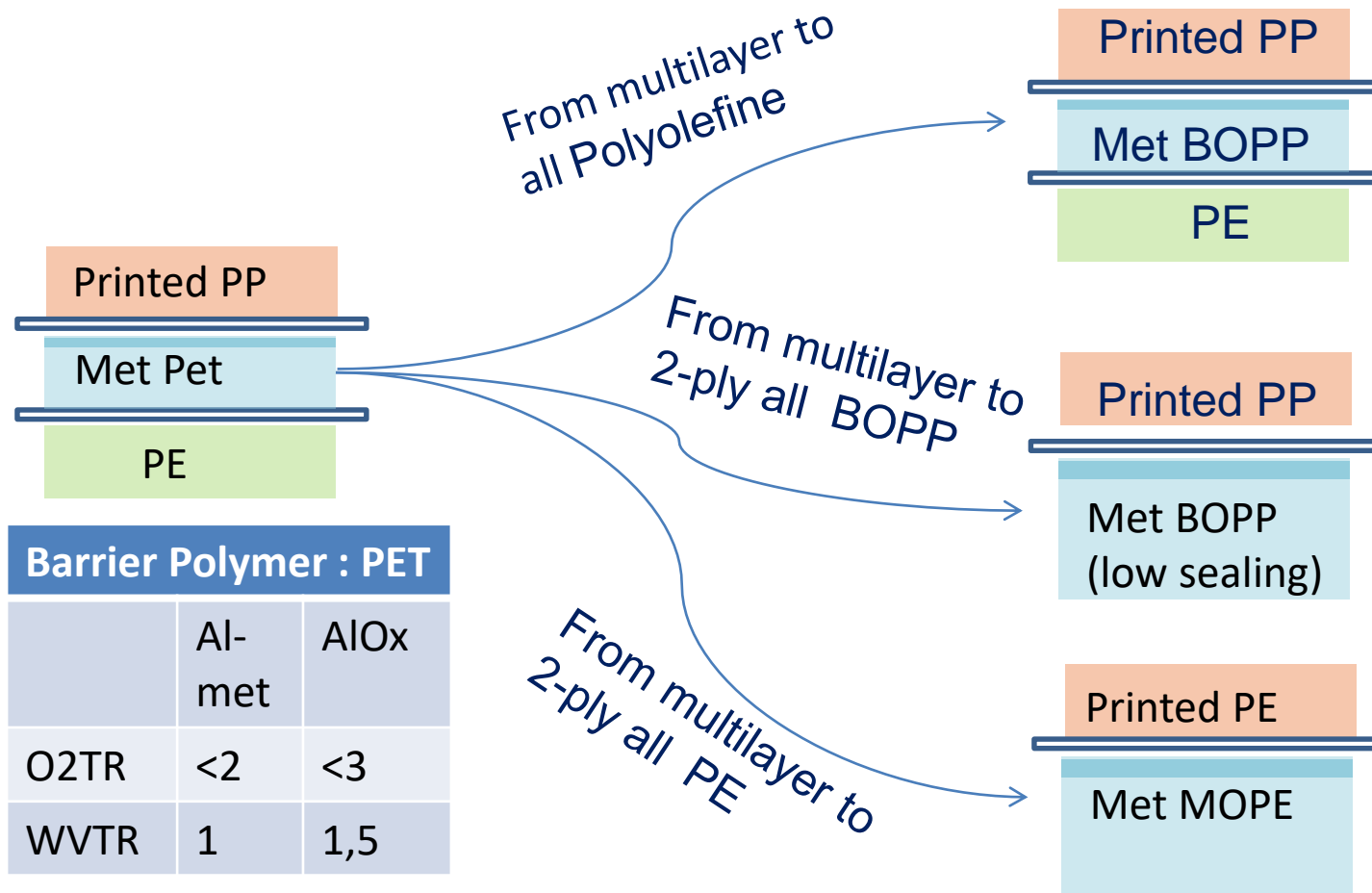
Ply Sequence	Function	materials	Properties
1	Print web	Paper, Pet , Bopp,OPA	Gloss or Matt Heat resistance Stiffness
2	Barrier web	Aluminium foil, met-Pet, AlOx- Pet, SiOx- Pet, met-OPA..	Protection from Light Oxygen, Water Barrier
3	Sealant web	LDPE, CPP	Heat seal ability

TODAY THE PACKAGE COULD BE MADE OF THREE DIFFERENT MATERIALS
(PP/mPET/PE; Pet/Al/PE etc.)

FOR THE GOAL OF FULL RECYCLABILITY, THE PACKAGING DESIGN NEEDS
TO BE CHANGED FOR A SINGLE POLYMER WHEREVER POSSIBLE



THE PATH TO SINGLE POLYMER AND THE «BARRIER» CHALLENGE



Barrier Polymer : PET

	Al-met	AlOx
O2TR	<2	<3
WVTR	1	1,5

Barrier Polymer : BOPP

	Al-met	AlOx
O2TR	20-80	>100
WVTR	0.5	>1

Barrier Polymer : MOPE

	Al-met	AlOx
O2TR	200	750
WVTR	2	7



POLYMER SURFACE ACTIVATION IN VACUUM COATING

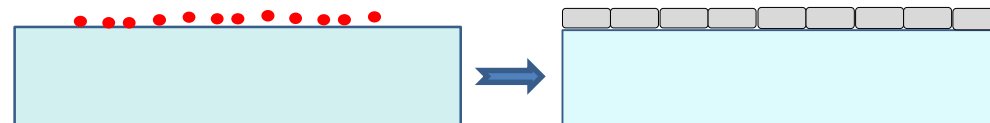
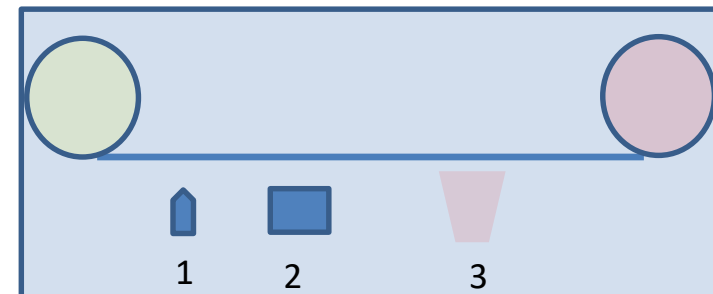
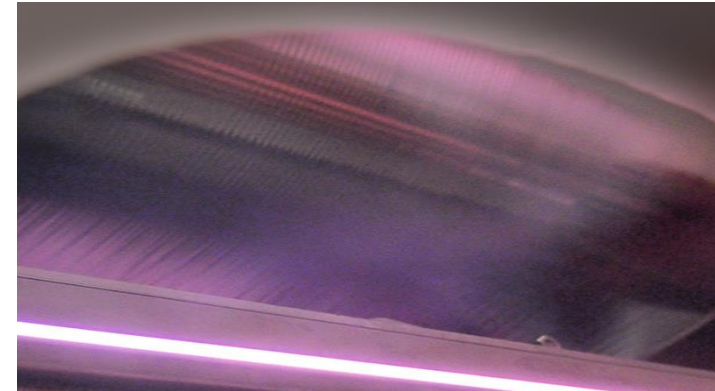
✓ PLASMA

- Cleaning and removal of organic contamination
- Oligomers Vaporization
- Microetching, scission, crosslinking, grafting and functionalization
- Increasing wettability

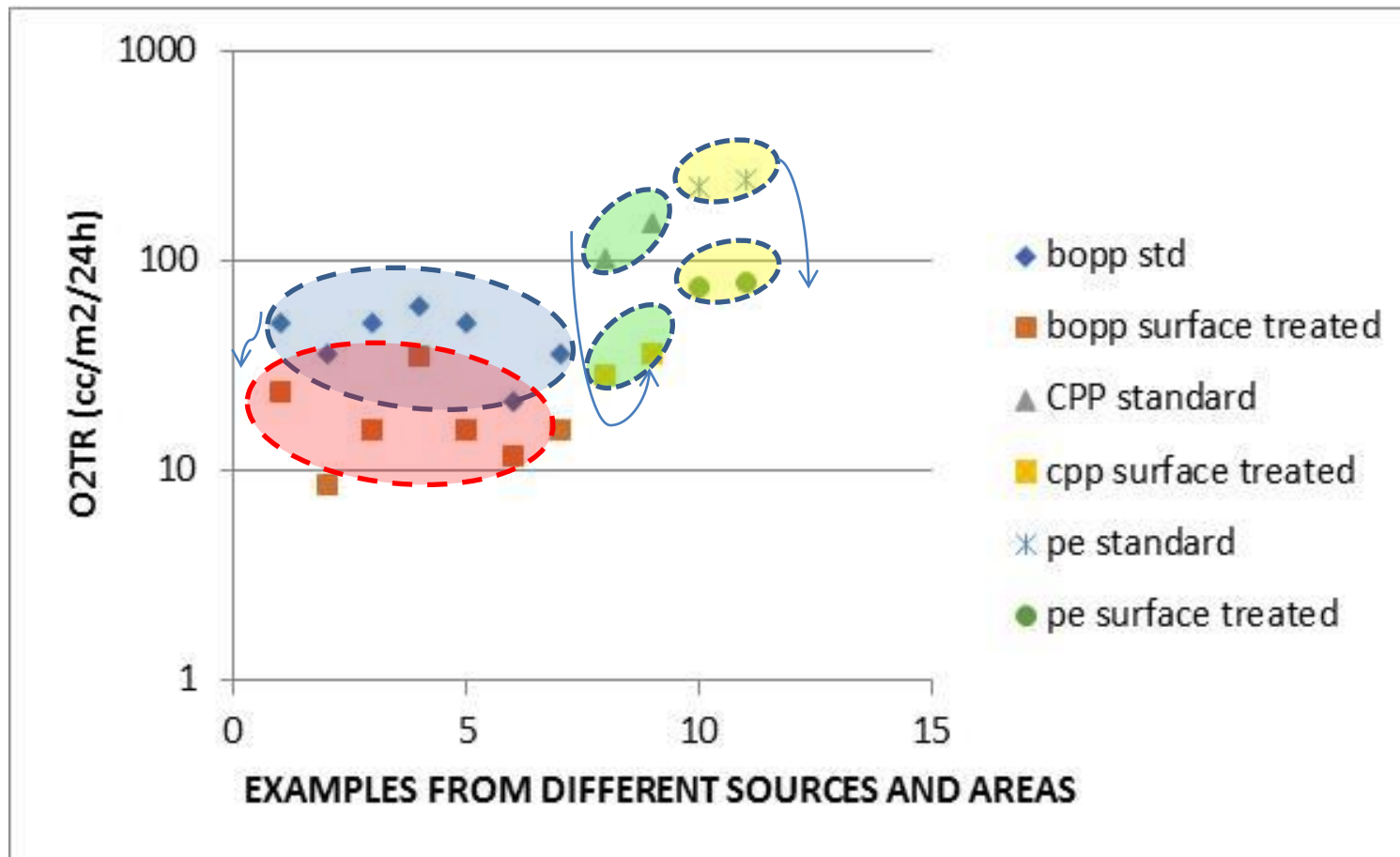
✓ IN-VACUO COATING (PML)

- 1 – Monomer dosing and application
- 2 - Energy curing (plasma, electron beam)
- 3 – Metal Deposition

✓ SURFACE ACTIVATION by DEPOSITION «SEEDING» or «Tie Layer»

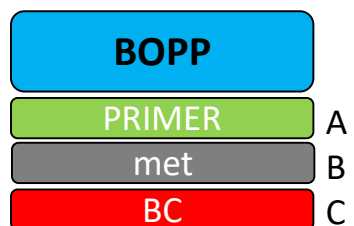
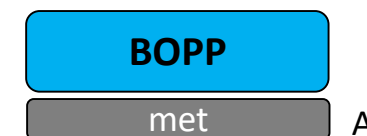
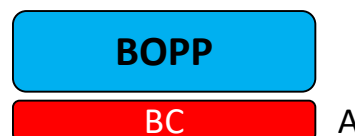
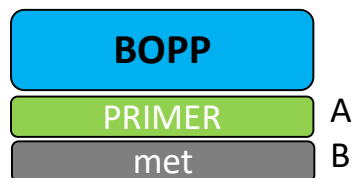


POLYMER SURFACE ACTIVATION IN VACUUM COATING (results from industrial trials)



COMBINED TECHNOLOGIES (VACUUM+ATMOSPHERIC COATING).

The case of Al-met BOPP



REPRESENTATIVE PROCESS DATA:

Bopp : commercial 17 micron film

Primer : water based metallization primer

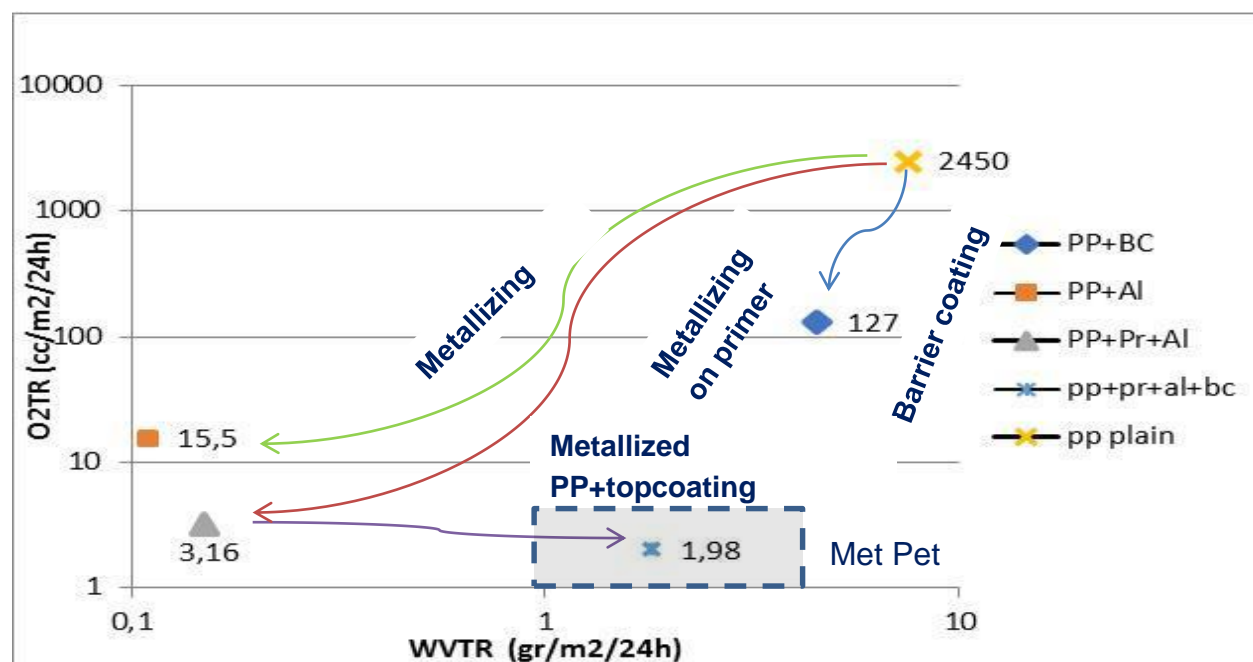
BC : barrier water based coating

Standard Nordmeccanica metallizing & Coating machines



COMBINED TECHNOLOGIES (VACUUM+ATMOSPHERIC COATING)

1) The case of Al-met BOPP



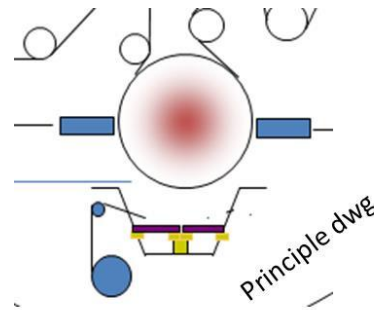
Tests on PE- cast film are currently in progress : the Vacuum-wet coating synergy is giving promising indications (O₂TR below 30 down to 1-2 cc/m²/24h depending on the treatment). Consistency of results under scrutiny



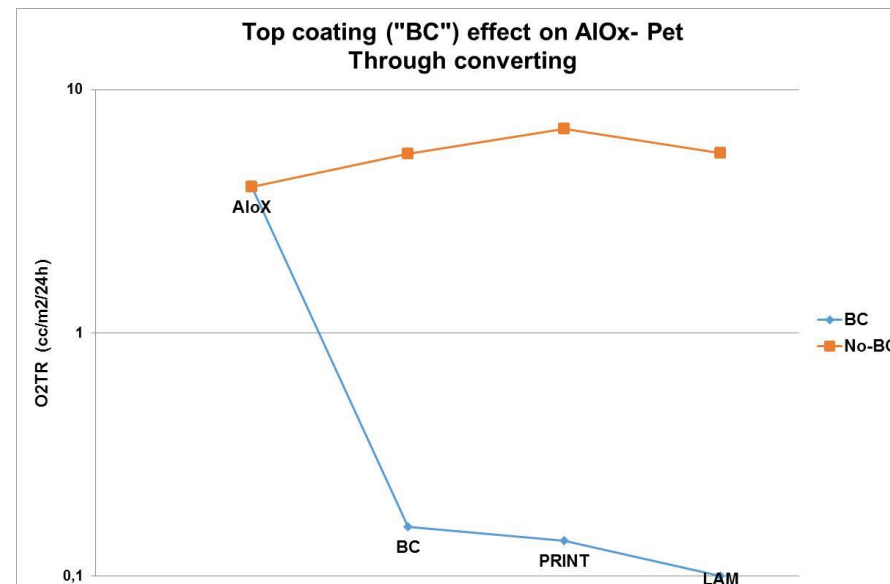
COMBINED TECHNOLOGIES (VACUUM+ATMOSPHERIC COATING)

2) The case of clear barrier Alox on PET

A relatively broad and consistent experience on AIOx coated Pet



Main and representative results from extensive industrial trials (from 2018 Aimcal Tech. Conference)



AIOX at 600 m/min



BC top coat 150 -200 m/min
0.5-0.7 gr/m²



Gravure print 150 -200 m/min
Standard inks



Lamination 150 -200 m/min
Solventless glue
50mic LDPE



COMBINED TECHNOLOGIES (VACUUM+ATMOSPHERIC COATING)

2) The case of clear barrier Alox on PET and BOPP

With Polyolefine(Polypropylene, Polyethylene etc.) the thin layer of vacuum deposited Aluminium oxide seems to be less effective than with Pet

(the table shows indicative and average values from commercial commodity films)

	PET		BOPP	
	mAlOx		mAlOx	
	O2TR	WVTR	O2TR	WVTR
Plain film	100	20	2500	7
AlOx vacuum coated	2	2	250	5
BIF(*)	50	10	10	1.5

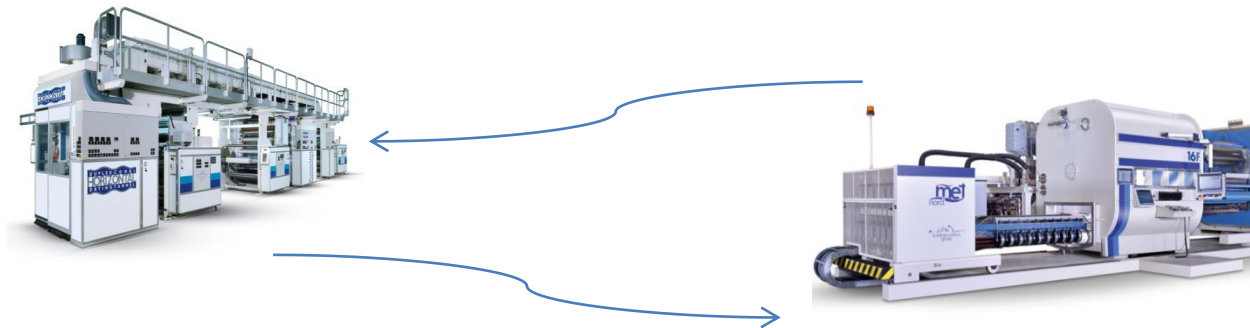
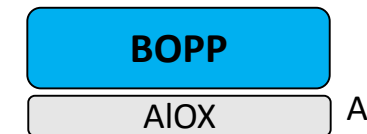
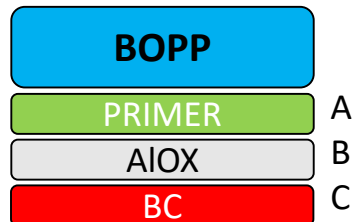
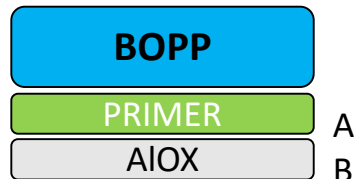


(*) Barrier Improvement Factor



COMBINED TECHNOLOGIES (VACUUM+ATMOSPHERIC COATING)

3) The case of clear barrier Alox on BOPP



REPRESENTATIVE PROCESS DATA:

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Primer : water based metallization primer

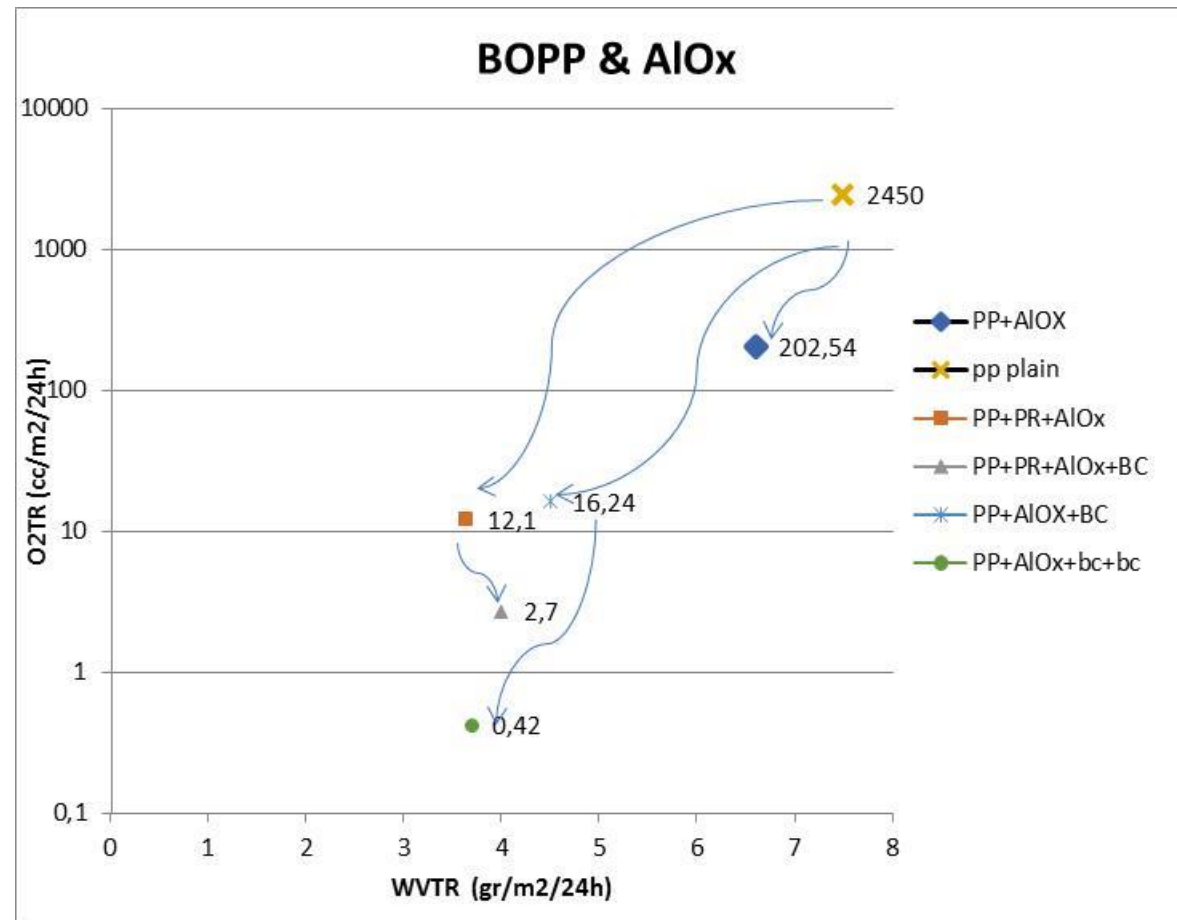
BC : barrier water based coating

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COMBINED TECHNOLOGIES (VACUUM+ATMOSPHERIC COATING)

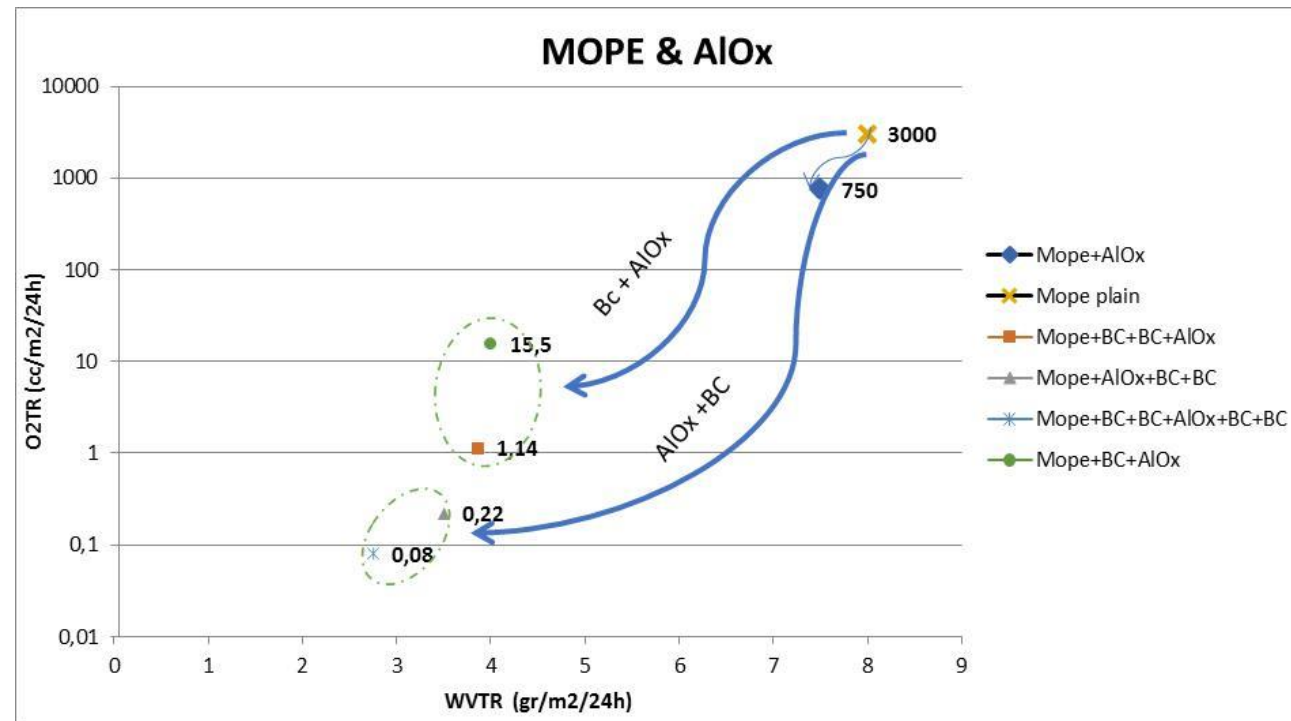
3) The case of clear barrier Alox on BOPP



COMBINED TECHNOLOGIES (VACUUM+ATMOSPHERIC COATING)

4) The case of clear barrier Alox coated modPE

While Tests on cast Pe showed , so far, poor and unconsistent barrier results, the MDO PE promising results are represented below



- THE FIRST PART OF THE PRESENTATION SHOWED A FEW EXAMPLES OF INDUSTRY COMMITMENTS TO SUSTAINABLE PACKAGING AND THE CONSEQUENT DRIVE TOWARDS FULLY RECYCLABLE MATERIALS
- ONE OF THE MAIN RECYCLABILITY REQUIREMENT IS FOR SINGLE MATERIAL PACKAGES WHEREVER POSSIBLE : WIDESPREAD EFFORTS TO PRODUCTS RE-DESIGNING IS IN PROGRESS, ADDRESSING THE ISSUES OF REPLACING THE TRADITIONAL MULTILAYER STRUCTURES .
- THE PRESENTATION HAS THEN FOCUSED ON THE DEVELOPMENT OF POLYOLEFINE SOLUTIONS CONCENTRATING ON BARRIER IMPROVEMENT THROUGH VACUUM AND /OR COMBINATION OF VACUUM AND ATMOSPHERIC COATINGS
- THE PRELIMINARY RESULTS ARE PROMISING AND , IN SOME CASES, OUTSTANDING , SUGGESTING TO GO FURTHER IN CHECKING THE REAL PROPERTIES OF THE NOVEL MATERIALS THROUGHUOUT THE ENTIRE PRODUCTION PROCESS LINE : PRINTING, LAMINATION SLITTING, BAG MAKING.



THERE ARE CERTAINLY OTHER ISSUES ON THE ROUTE TO PACKAGING REDESIGN AND MATERIAL SUBSTITUTION, NOT EVEN TOUCHED IN THIS PRESENTATION AND REQUIRING A MULTIFACETED APPROACH AND MULTIPLE COMPETENCES; EXAMPLES :

- **MATERIAL STRENGTH**
- **THERMAL RESISTANCE AND FUNCTIONALITY**
- **OPTICAL ASPECTS**
- **BOND STENGTH**
- **LEVEL OF BARRIER REQUIRED FOR SOME SPECIAL APPLICATIONS**
- **RETORTABILITY**
- **EXISTING PACKAGING MACHINES AND PROCESS SUITABILITY**

FROM OUR UNDERSTANDING, IT SEEMS THAT THE TREND TOWARDS MORE SUSTAINABLE PACKAGING MATERIAL IS HERE TO STAY AND CUSTOMERS ARE PUSHING ON MACHINE MANUFACTURERS FOR NEW AND MORE ADVANCED SOLUTIONS.



**From NORDMECCANICA VACUUM
DIVISION**

MANY THANKS FOR THE ATTENTION