



**TOTAL**

GRADES AND APPLICATIONS

# **POLYPROPYLENE LUMICENE®**

Complete product range for outstanding properties

A solution to new market requirements in rigid packaging

# A REVOLUTIONARY GENERATION OF RANDOM POLYPROPYLENE

AS AN ANSWER TO NEW MARKET CHALLENGES IN THE RIGID PACKAGING INDUSTRY

## NEW MARKET CHALLENGES:

- Food safety & compatibility: compliance with evolving food contact legislations (low migrations, good organoleptics, ...).
- Productivity increase: high production throughput, reduced cycle time, low reject rate.
- Packaging design evolution: easy to open and to close, transparency, light packaging, overpackaging reduction.
- Eco footprint reduction: waste thickness reduction while maintaining mechanical properties, less CO<sub>2</sub> emissions, less energy and water consumption.

Based on proprietary Metallocene technology, Total Refining & Chemicals has unveiled a unique range of Polypropylene Lumicene® Random Copolymers. Polypropylene Lumicene® expands on the range of applications for conventional PP and adds a new dimension to more tradition applications.

## IMPROVED PROPERTIES

- 1 Food compatibility and cooking (organoleptics, extractables)
- 2 Moulding productivity and longer machine lifetime
- 3 Gloss and transparency
- 4 Stiffness for downgauging
- 5 Costs savings

A complete product range providing outstanding properties



## WHICH MARKETS?

Producers of rigid food packaging, housewares and kitchenwares, caps and closures, baby bottles and medical devices will be able to take full advantage of Polypropylene Lumicene® Random product range. Thanks to their absence of phthalate, substitution of polymers such as Polycarbonate and PVC is also targeted with strong results achieved in demanding applications such as baby bottles production.

## FOOD SAFETY & COMPATIBILITY

### Evolving regulations

European regulation has established more severe testing conditions for simulating migration from the packaging to the food<sup>1</sup>.



### Standard conditions

10 days 40°C, olive oil



Polypropylene Lumicene® best by far.

Test conditions: 10 days at 40°C in olive oil<sup>2</sup> allowing the use of the packaging at ambient temperature food storage + 2 hours at 70°C or 15 minutes at 100°C.

### More severe conditions, more universal

2 hours 100°C, olive oil



Microwave heating and cooking<sup>3</sup>, sterilization, pasteurization: Polypropylene Lumicene® best by far.

Test conditions: 2 hours at 100°C in olive oil allowing the use of the packaging in universal conditions up to 121°C heat treatment. It represents the worst case of conditions for all food stimulant used for testing polyolefins.

### Superior food compatibility

Extractables, “lower is better”, according to customer’s perception. Ultra low extractables and best-in-class organoleptic properties give the Polypropylene Lumicene® range the status of universal grade for food packaging from freezer to microwave.

### Organoleptic properties

Less odor and less taste transfer. The lower the value, the lower the taste intensity.

### Taste intensity test

Products	Taste intensity
PET (bottle grade)	2.4
Polypropylene Lumicene® (homopolymer)	1.6

Test conditions: 4 hrs at 35°C, 500 ml water.

(1) Regulation (EU) 10/2011 on plastic materials and articles intended to come into contact with food.  
 (2) Olive oil is considered as worst case. It simulates fatty food. Ethanol and acetic acid are less critical for PP.  
 (3) Not suitable for dual ovenable trays (i.e. not suitable for baking or browning).



## HIGHER MOULDING PRODUCTIVITY

With standard random (Ziegler Natta catalyst) dimensional variation occurs from one injection shot to another due to variation in shrinkage. With Polypropylene Lumicene® moulding precision is much higher and the reproducibility between shots is much improved, giving a lower reject rate of specification parts. Polypropylene Lumicene® is the ideal material for applications requiring precision fit and tight dimensional tolerances.



## LONGER MACHINE AND MOULD LIFETIME

Polypropylene Lumicene® processing is much easier and smoother than standard polypropylene. For a given fluidity, Polypropylene Lumicene® processing temperatures and pressures can be significantly decreased, improving and increasing the injection machine lifetime. In addition, Polypropylene Lumicene® provokes less mould coating defaults than standard polypropylene. This default is caused by a mould deposit of short polymer chains and requires regular cleaning and maintenance operations. Thanks to the unique molecular weight distribution of metallocene technology, this default is significantly diminished, increasing the lifetime moulds.

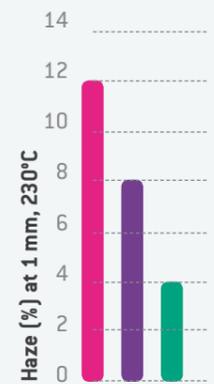


## UNMATCHABLE GLOSS AND TRANSPARENCY

Polypropylene Lumicene® are well known for their unmatched aesthetics (gloss and transparency). This property allows entering and competing with materials in markets that require high transparency and gloss like cosmetics, personal care, houseware and food packaging. Thanks to their high transparency (low haze) and higher gloss, substitution of glass and technical polymers (PC, PMMA, SAN, ...) is also targeted.

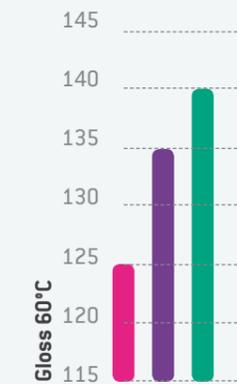


### Transparency



- Standard random PP
- Lumicene® MR30MC2
- Lumicene® MR10MX0

### Gloss



- Standard random PP
- Lumicene® MR30MC2
- Lumicene® MR10MX0



# A REVOLUTIONARY PRODUCT RANGE FOR OUTSTANDING PROPERTIES

For many years, Total Refining & Chemicals has demonstrated its expertise by providing latest generation polyolefin solutions to the Rigid Packaging world. Polypropylene Lumicene® grades give improved end product appearance whilst boosting productivity and allowing costs savings. Polypropylene Lumicene® Random product range benefits from food compliance even at high temperatures, allowing its uses up to 121°C, and are certified phthalate-free.



## A complete product range for cleaner and safer packaging. Polypropylene Lumicene® Random products available:

	Polypropylene Lumicene® MR10MX0	Polypropylene Lumicene® MR30MC2	Polypropylene Lumicene® MR60MC2	Polypropylene Lumicene® MR110MC2
MFI (g/10min)	10	30	60	110
Flexural Modulus (MPa)	1 250	1 250	1 250	1 300
Izod notched 23°C (kJ/m²)	5	5	5	5
Special features	Outstanding transparency Lowest migration Excellent organoleptics	High transparency Lowest migration Excellent organoleptics	High transparency Lowest migration Excellent organoleptics	High transparency Lowest migration Excellent organoleptics
Targeted applications	Baby bottles, ISBM containers, thermoformed cups and trays	Caps & Closures, Personal care & medical devices (syringes)	Housewares, Kitchenwares, Food packaging	Housewares, Kitchenware, Thin wall food packaging

# PRODUCTION COST SAVINGS

Case study performed on a thin wall food packaging trays, 16 g/part, single cavity mould, with Lumicene® MR110MC2 versus market reference.

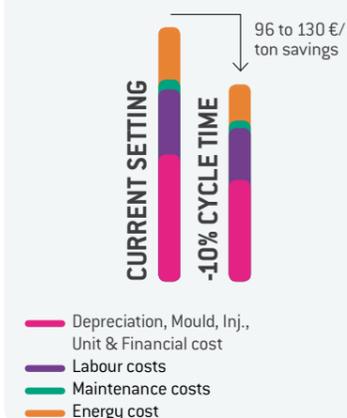


## COSTS REDUCTION:

**23%** energy consumption savings  
**60°C** processing temperature reduction  
**10%** cycle time reduction (less injection and cooling time)

**96 to 130 € / ton** PP savings  
**25.4%** less CO<sub>2</sub> emissions

## Production costs per ton of PP processed (€/ton) for the production of 16 gr part



# IMPROVED BALANCE IMPACT/RIGIDITY

Polypropylene Lumicene® product range benefits from an improved balance impact/rigidity, exhibiting 150MPa more rigidity, allowing down gauging and reduced cooling time as moulded parts can be ejected earlier than with conventional grades.

## Higher rigidity

- Downgauging
- Reduced cooling time

## Superior food compatibility

- Lowest migration
- Excellent organoleptics
- Sterilization and pasteurization allowed
- Phthalate free

## Improved productivity

- Higher throughput
- Longer machine lifetime
- Lower reject rate

Parts aesthetics  
Unmatched gloss and transparency

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The Refining & Chemicals Division of Total, one of the largest integrated oil and gas companies in the world, encompasses the refining and petrochemicals activities, and also the specialty chemicals, with 50,000 employees worldwide. The Refining & Chemicals Division is not only the first refiner and the second petrochemicals producer in Europe but includes 13 refineries, 20 petrochemicals production sites and more than 150 locations in specialty chemicals worldwide. The Refining & Chemicals Division produces and commercializes a wide range of product from petroleum products to commodity polymers including base chemicals intermediates. Those products are used in many consumer and industrial markets.

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