1.0 PURPOSE

The following specification has the purpose of describing the chemical, physical and mechanical aspects of the twin wall sheet produced by Ondaplast SpA.

2.0 APPLICATION

Before making any kind of manufacturing on the twin wall sheet produced by Ondaplast SpA, you have to evaluate the main features and properties described in the following "Technical Sheet" and verify the compatibility to the uses to which it will be addressed all along its life. For any doubt, explanation, suggestion, clarification etc…please contact the technical office (TEC) in Ondaplast Spa.

3.0 DESCRIPTION AND SUGGESTIONS ON THE POSSIBLE RISKS

Type of risk	Description and suggestions
U.V. Resistant	Polypropylene doesn't have a good resistance to the U.V. rays because it is subjected to photo degradation process. For the outside uses it is necessary to add an "U.V. resistant additive".
Corona Treatment	Ondaplast products have a value of Corona treatment equal to 42 dyne. In this condition the sheet can be glued and printed.
Low temperature use	Polypropylene at temperature below 5°C becomes brittle. It is possible to stock it below this temperature, but anyway its use is recommended at room temperature (10 – 30°C). See table 4
High temperature use	Polypropylene at high temperatures reduces its mechanical features and loses its antistatic nature. In order to avoid the loss of these characteristics, Ondaplast recommends application at temperature below 35 °C. See table 4
Glueing	Polypropylene can be glued with specific substances. Make sure about the presence of a Corona treatment.
Welding	Polypropylene can be welded with ultrasounds devices or by hot air machineries in order to obtain localized and controlled micro fusions.
Printing	Polypropylene can be printed by flexographic, serigraphic printing or ink-jet techniques. Verify the presence of an adequate Corona treatment. See table 7
Presence of moulds and bacteria and anti –	If stocked in aerated and dried places and in absence of any contamination, Ondaplast polypropylene products for pharmaceutical or food contact purpose

bacterial features	doesn't permit moulds or bacteria colonies growth. Ondaplast process is compliance with UNI EN 15593 regulation. It guarantees the hygiene of the food packaging (secondary) product. Polypropylene with anti-bacterial and anti mould agents is available upon request.
Food Compatibility	Virgin polypropylene with specific additives is compliant to come direct into contact with foodstuffs.
RoHS Directive	Ondaplast polypropylene is compliant with RoHS directives.
Cutting of the sheets	Polypropylene sheets can be cut through die cutting process or through the use of cutters that must be used with attention and in accordance with the security laws. See table 8
Mechanical Characteristics	The technical features depend on the relationship between thickness-weight . See tables 1-2-3.
Chemical agents resistance	Polypropylene is resistant to the most part of chemical agents. For particular substances it is better to make specific tests.
Caloured products' stability and brightness	Polypropylene can be extruded in a wide range of colours. The colour stability and its lifetime, depends on several factors and it is influenced by the exposition time to U.V. rays. If you need a specific request, please ask us for the colour fastness value according to ASTMD2565.
Anti-static properties	Polypropylene antistatic properties have a lifetime of 1-3 months. The lifetime decreases if the product is used and stocked in inappropriate condition or at high temperatures. See table 5.
Gas permeability	Mean value equal to 8 g/(m^2*day) at 40°C and 90% H.R.
Barrier effect	The extruded polypropylene, especially in thin thickness doesn't have a particularly efficient barrier effect due to its chemical-physical characteristics. For all uses in which particular barrier effect are requested, please contact the Ondaplast technical office to verify its feasibility.
Auto-extinguishing polypropylene	For specific uses that require auto-extinguishing properties is available a range of products with flame retardant additives, in compliance with the main International relevant legislations (UL94 class V2, DIN 4102 class B1, NF P92-507, LPCB, etc.)

4.0 CHARACTERISTICS

Table 1

PP physical properties			
Property	Method	Measurement Unit	Value
Specific weight	ISO 1183	g/cm^3	0,907
Water absorbtion	ISO 62	%	0,02

Table 2

PP mechanical properties			
Property	Method	Measurement Unit	Value
Tensile strength (50 mm/min)	ISO 527	MPa	30
Breaking extension (50 mm/min)	ISO 527	%	750
Flexion modulus	ISO 178	MPa	1100
Impact resistance IZOD (23°C)	ISO 180	kJ/m^2	50
D Shore Hardness	ISO 868	-	66

Table 3

Sheet' mechanical properties				
Property		Method	Measurement Unit	Value
Maximum compression effort	2,0 mm/350 gr	Internal	N/cm^2	min. 25
	2,0 mm/400 gr	Internal	N/cm^2	min. 35
	3,0 mm/650 gr	Internal	N/cm^2	min. 55
	3,0 mm/800 gr	Internal	N/cm^2	min. 65

Table 4

Sheets'heat properties			
Property	Method	Measurement Unit	Value
Expansion Coefficient	ASTM D 696	$°C^{-1}$	0,18

The polypropylene has excellent mechanical properties, shock and breaking resistance at 23° C. These properties are strictly compromised at low temperatures, near or below 0° C . For specific use at low temperatures, please

Table 5

Sheets' electrical properties			
Property	Method	Measurement Unit	Value
Standard surface resistivity	ASTM D 257	Ω	ca. 10^{13}
Antistatic surface resistivity	ASTM D 257	Ω	ca. 10^{11}
Conductive surface resistivity	ASTM D 257	Ω	ca. 10^{6}

Table 6

Chemical resistance
Polypropylene guarantees resistance to oil, fat, saline solutions; acids, bases at temperature lower than 60°C. PP is not resistant to substances with high oxidizing effect. Polypropylene is a polymer which will swell if exposed to certain solvents

Table 7

Printing
Corona treatment is on both sides is guaranteed for 3 months from the date of manufacture, marked on each packed. Ondaplast also recommended that special inks for polypropylene are used.

Table 8

Cutting and creasing
It is recommended to store the material at temperatures around 20° C. Cutting and creasing are possible on automatic and manual systems.

Table 9

Further information
Twin wall sheets need between 48 to 72 hours after delivery to acclimatize at room temperature (around 20° C). Do not stack the pallets. Remove the banding from the pallets on receipts.

5.0 RELEVANT REGULATIONS

Food regulation: comply with Regulation (UE) n° 10/2011 of 14.01.2011 relating to plastic materials and articles intended to come into contact with foodstuffs.

Coneg Regulation (USA) and directive 94/62/EC: heavy metals (cadmium, lead, mercury, and chromium (VI)) content below 100ppm

D.Lgs n° 54 of 11/04/2011 (Directive 2009/48/CE concerning games safety): comply with the Decree except the flammability part that should be expressively requested. It is a customer obligation to provide for the complete certification.

NRoHS 2002/95/EC directive (European Parliament and Council of 27 January 2003): comply with requirements on the restriction of use of certain hazardous substances in electrical and electronic equipment.

BRE LPS 1207 (on a specific request): in compliance with the regulation concerning the auto-extinguishing materials (test of small flame, test of big flame, test of gas emission, test of toxic gas emission, test on the oxygen index). Please stock the product far from heat source and at room temperature.

The test results are based upon raw materials according to our current knowledge
The technical data concerning our products are not binding and are given for guidance only.