

Analytical Report No. L14101

Investigation of Multilayer Pipe Sample

Prepared for

**Capricorn, Poland
December 2014**

Background:

Mitsui Chemicals Europe GmbH received one multilayer pipe sample from company Capricorn. This sample was evaluated in the Admer-Application-Lab.

The structure of the investigated pipe was as follows:

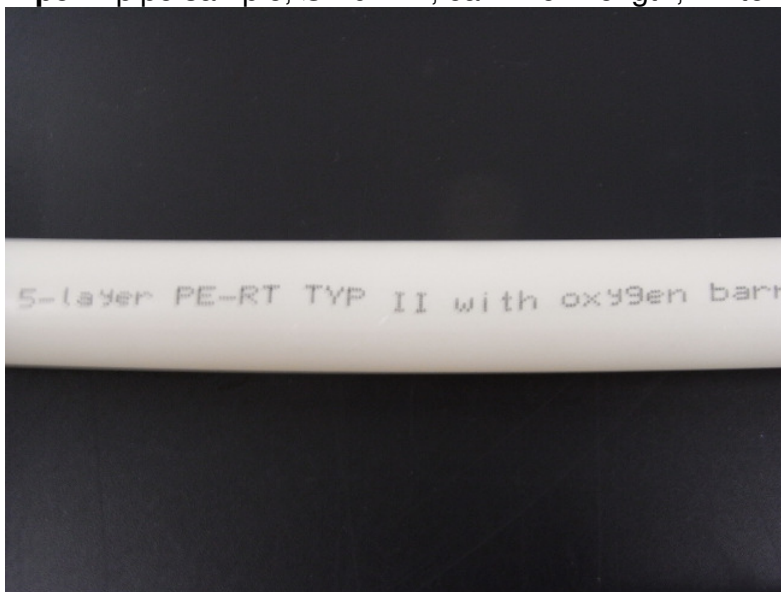
PE (inside) / Tie / EVOH / Tie / PE (outside)

Analysis performed:

- Layer thickness distribution by polarisation microscope
- Adhesion strength by tensile tester

Sample information:

- **Pipe:** 1 pipe sample, Ø 20 mm, ca. 47 cm length, white

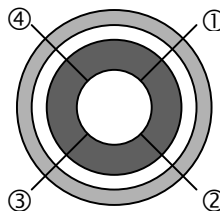


Results:

- **Layer thickness distribution by polarisation microscope**

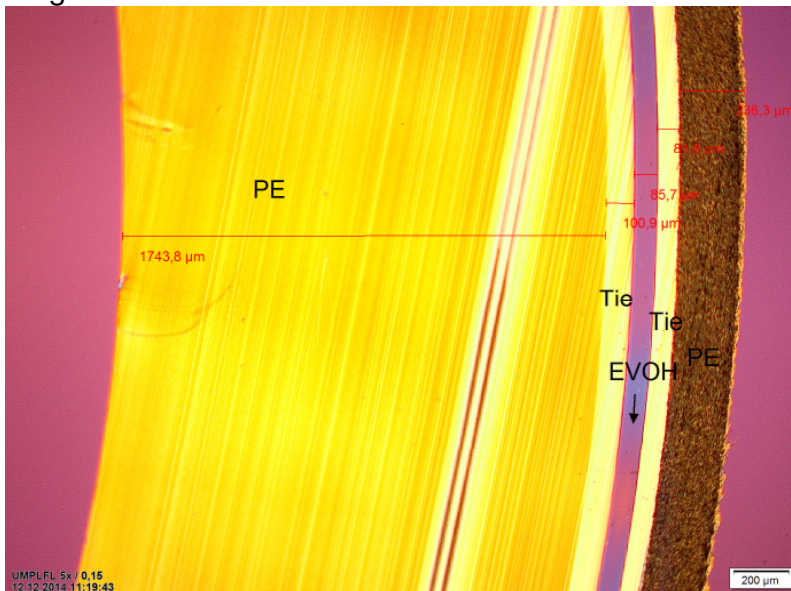
The layer thickness distributions of the pipe sample was analysed by microtome / microscope crosswise at four locations as it is shown in the picture below.

The position of measured points.



Location 2:

Magnification 25x:



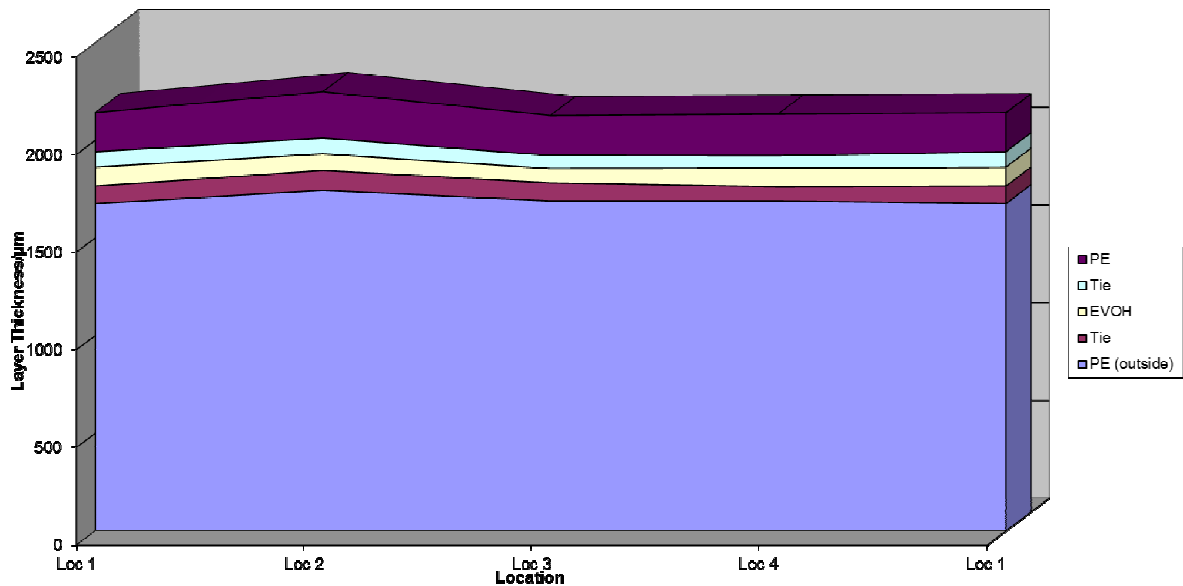
Layer thickness in μm :

Layer Thickness/ μm				
	Location 1	Location 2	Location 3	Location 4
PE (outside)	1676	1744	1690	1690
Tie	90	101	93	72
EVOH	97	86	73	96
Tie	79	82	66	64
PE	199	236	205	213
total	2141	2248	2127	2135

Layer thickness in %:

Layer Thickness/%						
	Location 1	Location 2	Location 3	Location 4	Average	Std.-Dev.
PE (outside)	78,3	77,6	79,4	79,2	78,6	0,9
Tie	4,2	4,5	4,4	3,4	4,1	0,5
EVOH	4,5	3,8	3,4	4,5	4,1	0,5
Tie	3,7	3,6	3,1	3,0	3,4	0,4
PE	9,3	10,5	9,6	10,0	9,9	0,5
total	100	100	100	100	100	

Layer thickness distribution:



- **Adhesion strength by tensile tester**

Adhesion strength [N/10mm]	
Measurement 1	torn
Measurement 2	torn
Measurement 3	torn

Measurement conditions: ISO 17454 (50 mm/min, 23°C, radial direction)

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