



Sampling and analysis of products deriving from ELT mechanical recovery, in order to determine the content of impurities

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- End of Life tires (ELT's) are managed through the “extended producer responsibility” scheme
- Ecoelastika is the certified collective system responsible for the ELT's management in Greece
- Stages of ELT's management:
 - Collection of ELT's from dealers all over Greece
 - Delivery of ELT's to recovery units
 - Production and sale of end products and by-products made of ELT's

Sampling of products and by-products from End of Life Tyre (ELT) mechanical treatment:

- Rubber (crumb and powder)
- Textile
- Steel (wire)

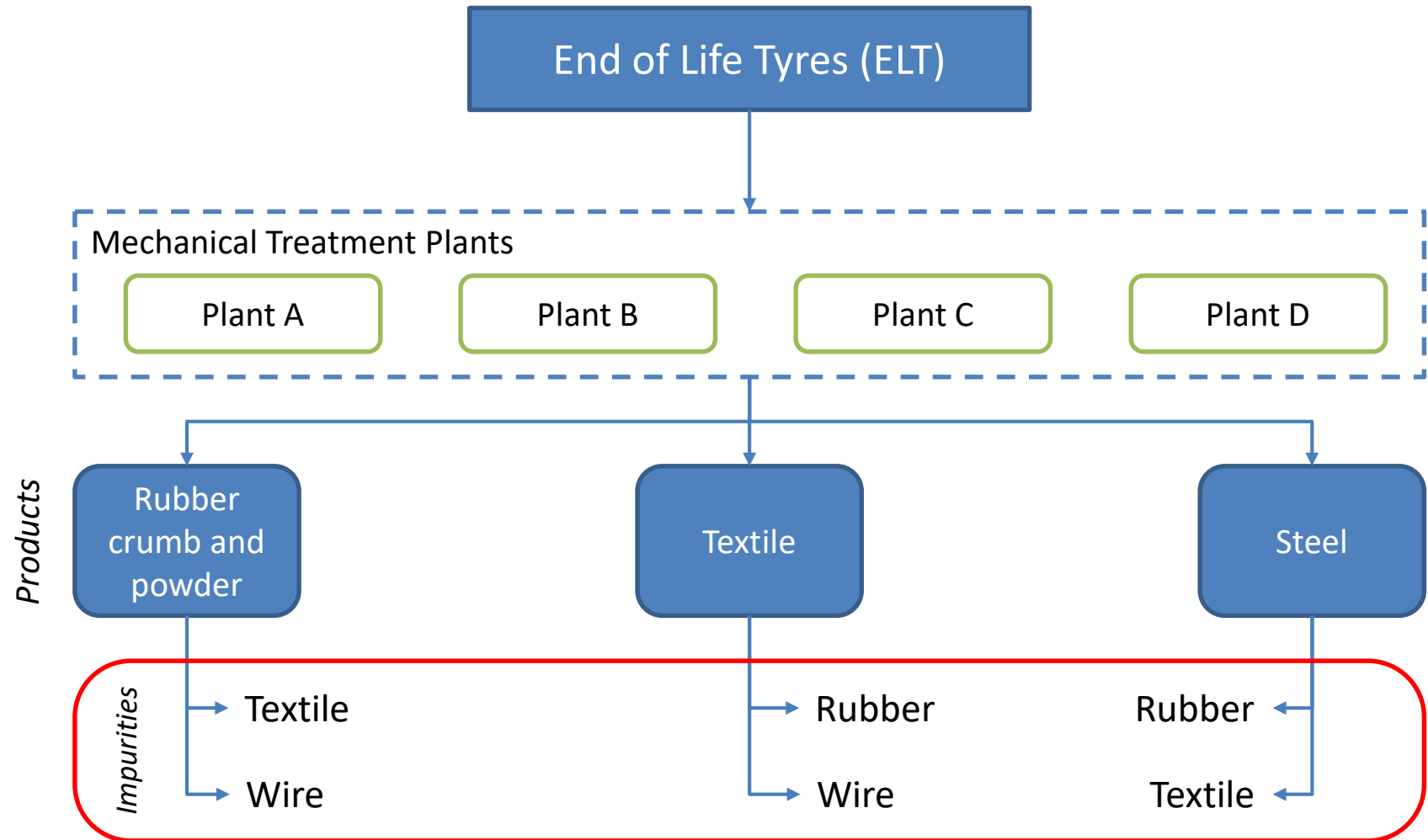
in plants located in the following regions:

- Plant A, located in Attica region
- Plant B, located in Achaia region
- Plant C, located in Drama region
- Plant D, located in Larissa region

In order to assess the content of the impurities.

Sampling and analyses were carried out according to CEN/TS 14243:2010

Study flowchart



- Sampling procedure design according to CEN/TS 14243:2010
- Sampling lot -> monthly production of each material for homogeneity
- Sampling from static lots and from temporary storage lots



- Separate design for each plant and product type based on production amounts and given equations
- Rubber sampling for each of the produced granulometry

- Minimum increment size
 - Rubber: 500ml
 - Textile: 0,2 kg
 - Steel: 0,5 kg

- Increment number calculation based on monthly production



	Rubber	Textile	Steel
Plant A	2 samples / 7 incr. / 3,5 lt	1 sample / 6 incr. / 1,2 kg	1 sample / 5 incr. / 2,5 kg
Plant B	3 samples / 12 incr. / 6 lt	1 sample / 5 incr. / 1,0 kg	1 sample / 6 incr. / 3,0 kg
Plant C	3 samples / 14 incr. / 7 lt	1 sample / 5 incr. / 1,0 kg	1 sample / 5 incr. / 2,5 kg
Plant D	3 samples / 12 incr. / 6 lt	1 sample / 5 incr. / 1,0 kg	1 sample / 6 incr. / 3,0 kg



Rubber



Rubber powder
< 0.8mm



Rubber powder
0.8 – 2.5 mm



Rubber powder
2.5 – 4.2 mm

Textile



Steel Wire



- Rubber crumb / powder
 - Sieving for textile content
 - Sieves size – 0.25 / 0.5 / 0.8 / 1 / 2 / 3.15 / 4.75 / 6.3 mm
 - Separation with magnet for steel content
- Textile
 - Sieving for textile content
 - Sieves size – 0.25 / 0.5 / 0.8 / 1 mm
 - Separation with magnet for steel content
- Steel

Magnet



Manual Separation



Steel wire



Rubber crumb



Textile



Agglomerate
Rubber / Wire

Analyses Results

Impurities in rubber (1/3)

Plant A

Crumb 0,5 – 1,5 mm			Crumb 0,5 – 2,5 mm		
Sieves	% Rubber	% Textile	Sieves	% Rubber	% Textile
>3,15 mm	4,1 %	-	>3,15 mm	11,8 %	-
3,15-2,00 mm	46,3 %	-	3,15-2,00 mm	56,4 %	-
2,00-1,00 mm	47,9 %	-	2,00-1,00 mm	31,1 %	-
1000-800 µm	1,5 %	-	1000-800 µm	0,4 %	-
800-500 µm	0,2 %	-	800-500 µm	0,0 %	-
<500 - 250µm	0,0 %	-	<500 - 250µm	0,0 %	-
<250µm	0,1 %	-	<250µm	0,1	-
Total	100 %	-	Total	100 %	-

Plant B

Powder <0,8mm			Crumb 0,8 – 2,5 mm			Crumb 2,5 – 4,2 mm		
Sieves	% Rubber	% Textile	Sieves	% Rubber	% Textile	Sieves	% Rubber	% Textile
>1000 µm	0,1 %	-	>3,15 mm	>0,1 %	-	>6,30 mm	-	-
1000-800 µm	0,2 %	-	3,15-2,00 mm	7,5 %	-	6,30-4,75 mm	-	-
800-500 µm	16,6 %	-	2,00-1,00 mm	58,8 %	-	4,75-3,15 mm	60,8 %	-
500-250 µm	54,1 %	-	1000-800 µm	11,0 %	-	3,15-2,00 mm	33,0 %	-
<500 µm	29,1 %	-	800-500 µm	14,7 %	-	<2,00 mm	6,3 %	-
			<500 µm	7,9 %				
Total	100 %	-	Total	100 %	-	Total	100 %	-

Analyses Results

Impurities in rubber (2/3)

Plant C

Powder <0,8mm			Crumb 0,8 – 2mm			Crumb 2 – 4mm		
Sieves	% Rubber	% Textile	Sieves	% Rubber	% Textile	Sieves	% Rubber	% Textile
>1000 µm	1,3 %	-	>3,15 mm	>0,1 %	-	>6,30 mm	-	-
1000-800 µm	10,7 %	-	3,15-2,00 mm	6,4 %	-	6,30-4,75 mm	-	-
800-500 µm	42,1 %	-	2,00-1,00 mm	78,3 %	-	4,75-3,15 mm	83,2 %	-
500-250 µm	37,0 %	-	1000-800 µm	12,5 %	-	3,15-2,00 mm	15,4 %	-
<500 µm	9,0 %	-	800-500 µm	2,6 %	-	<2,00 mm	1,4 %	-
			<500 µm	0,2 %				
Total	100 %	-	Total	100 %	-	Total	100 %	-

Plant D

Powder <0,8mm			Crumb 1 – 3 mm			Crumb 2 – 4 mm		
Sieves	% Rubber	% Textile	Sieves	% Rubber	% Textile	Sieves	% Rubber	% Textile
>1000 µm	0,1 %	0,7%	>3,15 mm	14,2 %	-	>6,30 mm	-	-
1000-800 µm	1 %	-	3,15-2,00 mm	35,9 %	-	6,30-4,75 mm	-	-
800-500 µm	37,8 %	0,1%	2,00-1,00 mm	38,3 %	-	4,75-3,15 mm	86,7 %	-
500-250 µm	43,4 %	0,3%	1000-800 µm	5,7 %	-	3,15-2,00 mm	12,6 %	-
<500 µm	16,7 %	-	<800 µm	5,9 %	-	<2,00 mm	0,7 %	-
Total	98,9 %	1,1%	Total	100 %	-	Total	100 %	-

Analyses Results

Impurities in rubber (3/3)

	Granulometry	Rubber (%)	Steel (%)
Plant A	0,5 – 1,5 mm	99,99 %	0,01 %
	0,5 – 2,5 mm	99,99 %	0,01 %
Plant B	<0,8 mm	99,98 %	0,02 %
	0,8-2,5 mm	99,99 %	0,01 %
	2,5-4,0 mm	99,98 %	0,02 %
Plant C	<0,8 mm	99,99 %	0,01 %
	0,8-2,0 mm	99,97 %	0,03 %
	2,0-4,0 mm	99,91 %	0,09 %
Plant D	<0,8 mm	99,99 %	0,01 %
	1,0-3,0 mm	99,99 %	0,01 %
	2,0-4,0 mm	99,99 %	0,01 %

Analyses results

Impurities in steel wire

	Plant A	Plant B	Plant C	Plant D
Agglomerate (%)	4,87%	1,68%	2,84%	17,39%
Wire (%)	2,85%	0,76%	1,34%	5,22%
Rubber (%)	2,02%	0,92%	1,50%	12,17%
Steel Wire total (%)	96,83%	95,28%	97,37%	72,22%
Textile total (%)	0,49%	1,52%	0,43%	6,09%
Rubber Total (%)	2,68%	3,21%	2,20%	21,70%
TOTAL impurities (%)	3,17%	4,72%	2,63%	27,78%

Analyses results

Impurities in textiles

	Plant A		Plant B		Plant C		Plant D	
	% Rubber	% Textile	% Rubber	% Textile	% Rubber	% Textile	% Rubber	% Textile
>1000 μm	11,8 %	64,6 %	0,5 %	90,5 %	7,5 %	77,7 %	3,6 %	92,6 %
1000-800 μm	6,3 %	-	0,3 %	-	1,4 %	>0,1 %	0,7 %	-
800-500 μm	7,9 %	-	1,2 %	-	4,1 %	-	0,7 %	-
500-250 μm	5,7 %	0,1 %	3,5 %	0,3 %	3,5 %	0,2 %	0,6 %	-
<250 μm	3,6 %	-	3,6 %	-	5,2 %	0,4 %	1,5 %	0,4 %
Total	35,3 %	64,7 %	9,2 %	90,8 %	21,7 %	78,3 %	7,0 %	93,0 %

- Products of rubber crumb found textile free. Exception is the smallest fraction of Plant D containing 1.1% textile
- Crumb rubber wire content, ranging from 0.01% to 0.09%. Most cases 0.01%.
- Textile is steel free. However, content of rubber ranging from 7% at Plant D to 35.3% of plant A.
- Steel Wire for plants A, B and C contains impurities ranging from 2.5% – 4.5%. Highest percentage is presented for plant D containing 27.5% impurities (21.7% rubber)

Thank you