«Farklı Hurda Kaynaklarının Sıvı Metal Kalitesine ve Mekanik Özelliklere Etkisi»

«Effect of Different Scraps on Liquid Metal Quality»

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3.Oturum / 3rd Session

Oturum Başkanı / Session Chairman: Doç. Dr. Çağlar Yüksel (Marmara Üniversitesi)

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About Cevher

1955 — **Foundation of CEVHER**
by Hüseyin Özyavuz

1968 — **Bornova Plant, Izmir**
Gravity Die Casting,
Tool Shop and Development

1985 — **Foundation of CEVHER Mak. San. A.S. (CMS)**
The First Wheel Plant in Turkey

1997 — **Cigli Plant, Izmir**
First 2 Halls

2000 — **End of partnership between Özyavuz and Ösen Families**
The Transfer of Cevher Mak. San. to Family Ösen under the Name of CMS

2003 — **Expansion of Cigli Plant, Izmir**
HP Die Casting and Mach.

Gaziemir Plant, Izmir
LP Die Casting, Wheel Production

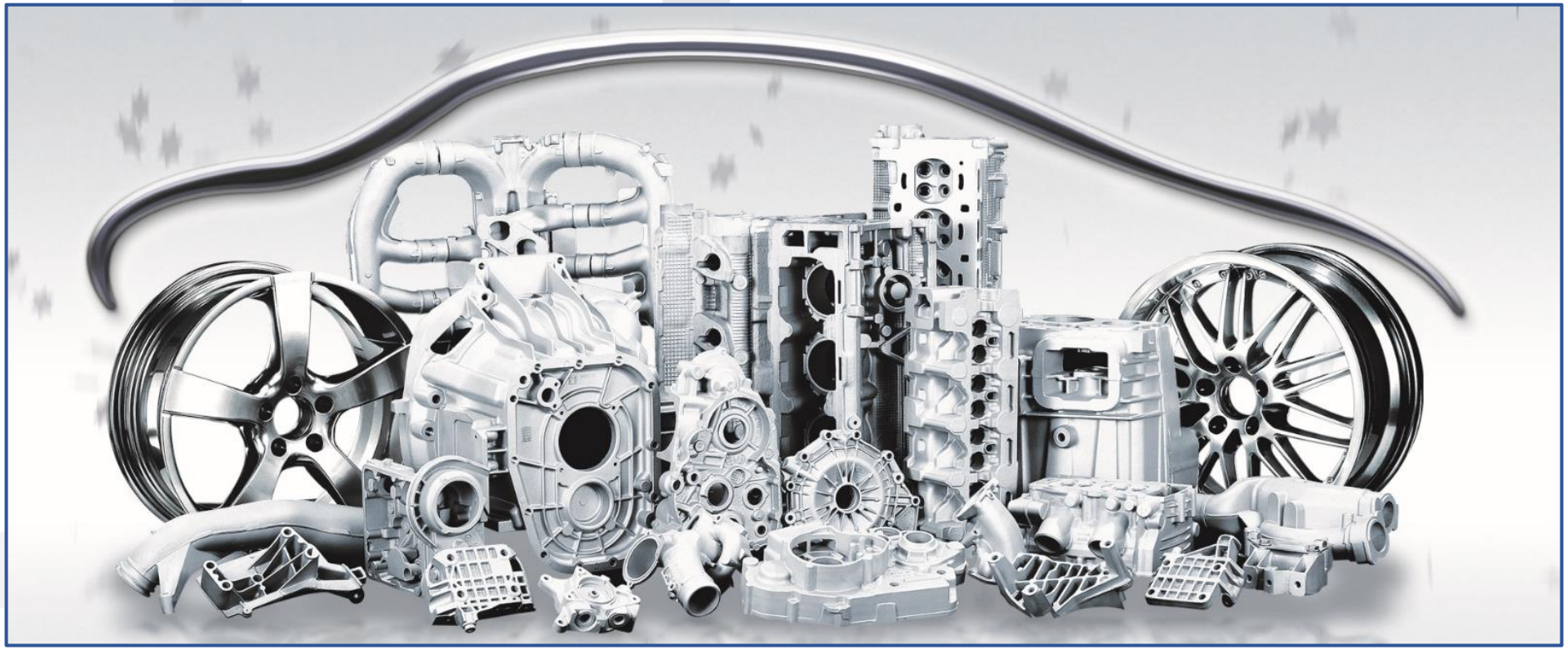
2016 — **Sales of Cigli Plant to Nemak** (Gravity and High Pressure Die Casting)

2018 — **Completing the first phase of capacity expansion project**

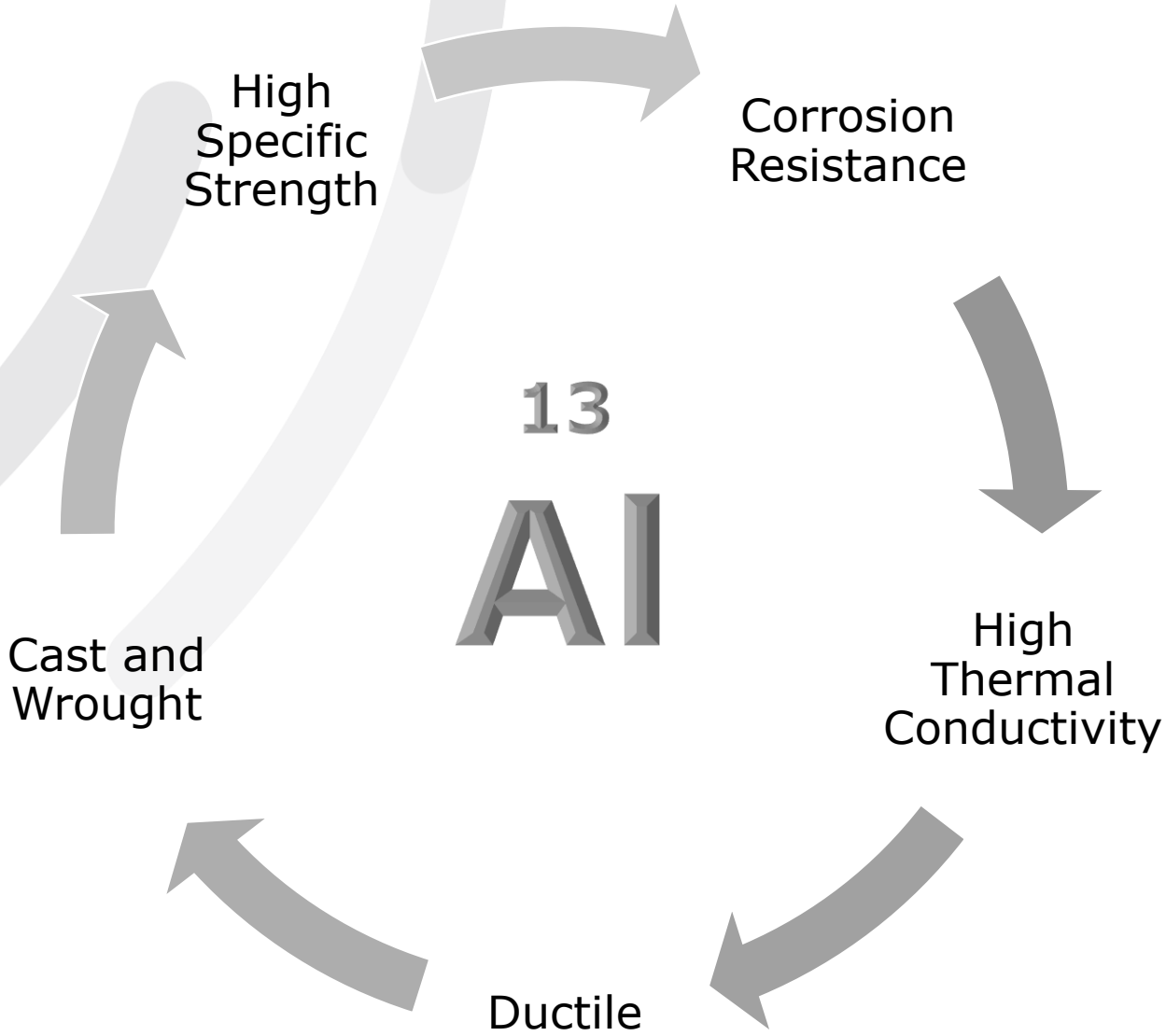
Purchasing a New Production Site in Free Zone , Izmir

2020 - 2022 — **New Investment**
Low Pressure Die Casting
Investment for Chasis/Structual Parts
SOF of new paintshop

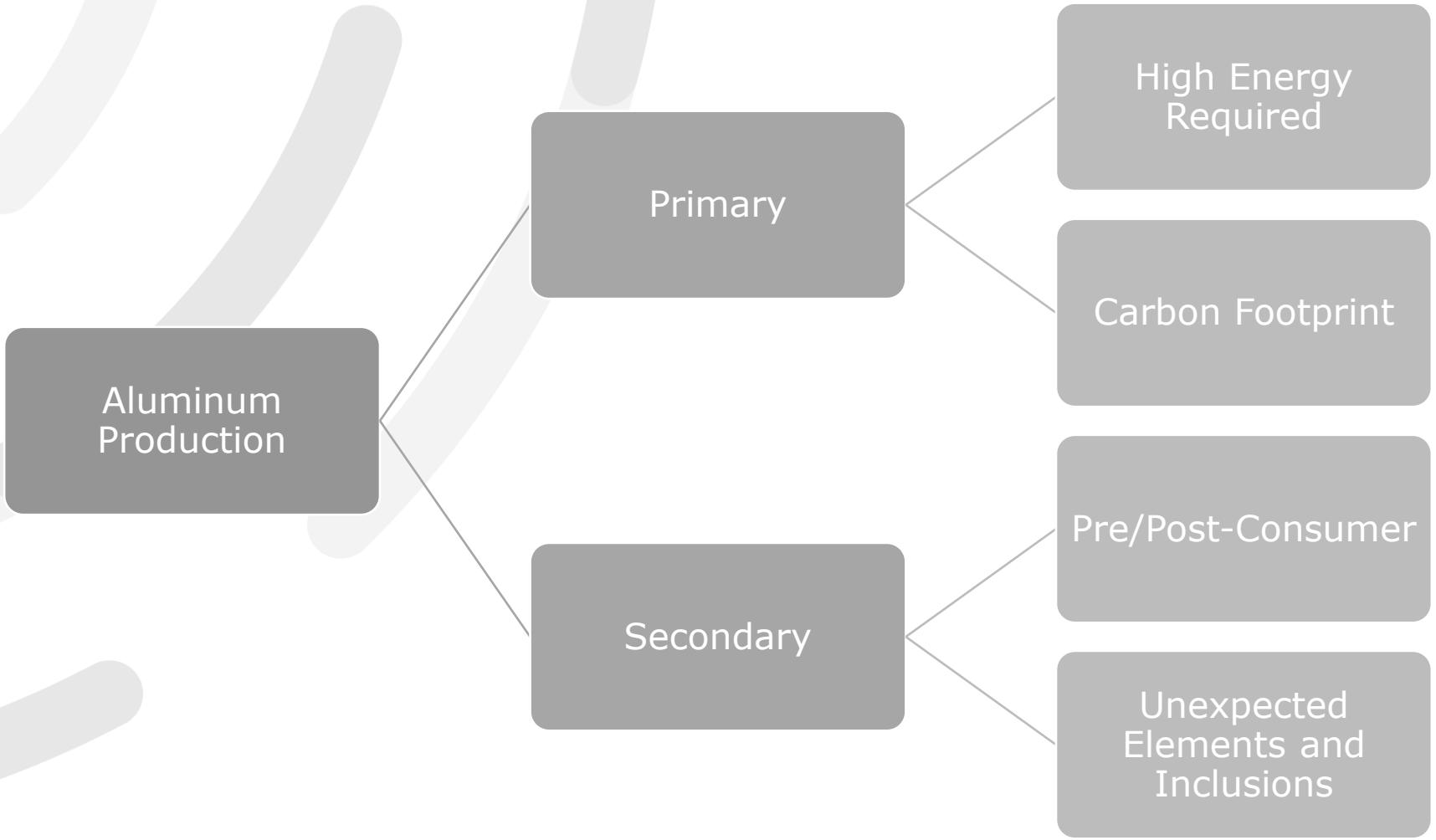
About Cevher



Introduction



Introduction



Experimental Study

Table 1. Secondary Aluminum Ratios

Exp.	Chips (%)	Scrap Wheel (%)
1	100	0
2	90	10
3	75	25
4	50	50
5	25	75
6	0	100

- The melting process of A356 scrap alloys was carried out in a SiC crucible in an 8 kg capacity electric resistance furnace with a power of 10 kW.
- Chemical composition analysis were performed with ARL brand optical spectrometer according to EN 1706 standard.
- If the Fe content increases, the scrap resource increases.

Table 2. Chemical Composition of Scrap Sources

%	Si	Fe	Cu	Mn	Mg	Sr	Ti	Ca	Cr	V	Pb	Na	Al
Chips	7.48	0.1	0.001	0.002	0.26	0.008	0.11	0.002	0.001	0.01	0.001	0.001	Bal.
Scrap Wheel	7.48	0.46	0.001	0.004	0.23	0.010	0.12	0.001	0.001	0.01	0.001	0.001	Bal.

Experimental Study

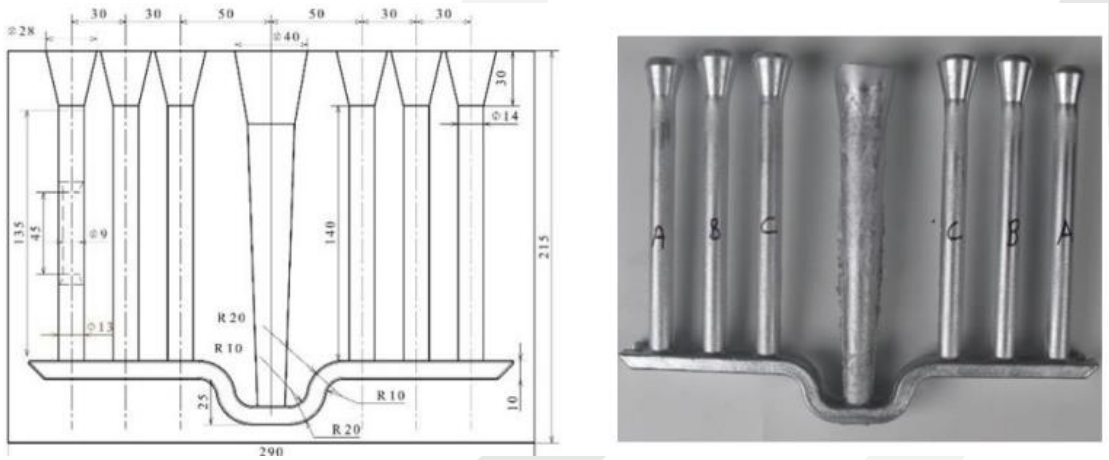


Fig 1. Tensile Test Bars

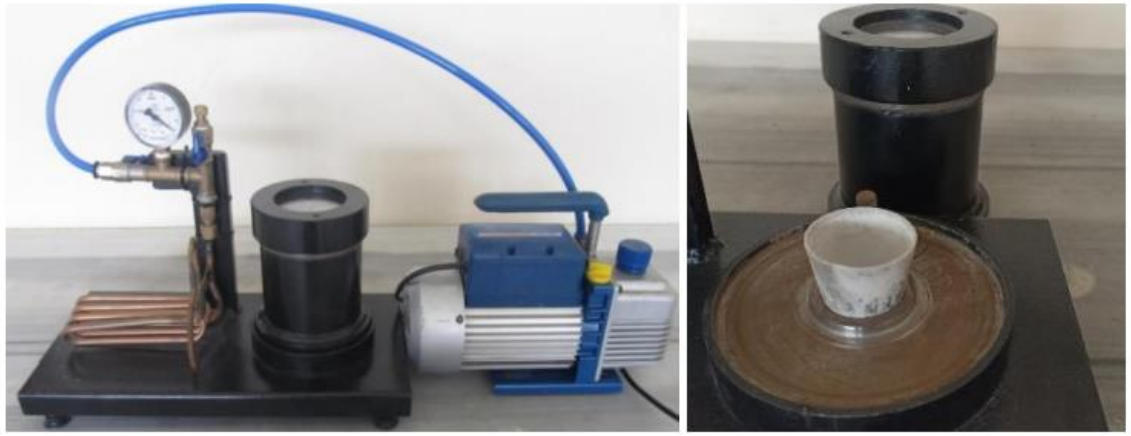


Fig 2. Reduced Pressure Test

- Tensile test specimens are arranged from A to C from outside to inside.
- Bifilm analyses were performed by using reduced pressure test. In the bifilm analysis, the inside of the cut samples were colored and the amount of porosity inside was measured.

Results and Discussions

Table 3. Chemical Composition of Casting Samples

Exp.	Si %	Fe %	Cu %	Mn %	Mg %	Sr %	Ti %	Ca %	Cr %	V %	Pb %	Na %	Al %
1	7.049	0.101	0.001	0.0019	0.251	0.0070	0.123	0.0018	0.0014	0.011	0.0009	0.0001	Rem.
2	7.212	0.135	0.001	0.0021	0.256	0.0064	0.119	0.0016	0.0015	0.011	0.0010	0.0001	Rem.
3	7.089	0.188	0.001	0.0022	0.248	0.0063	0.118	0.0015	0.0015	0.011	0.0010	0.0001	Rem.
4	6.927	0.259	0.001	0.0026	0.234	0.0058	0.129	0.0012	0.0017	0.011	0.0010	0.0001	Rem.
5	6.820	0.337	0.001	0.0030	0.225	0.0062	0.127	0.0011	0.0019	0.011	0.0010	0.0001	Rem.
6	7.048	0.448	0.001	0.036	0.228	0.0067	0.126	0.0010	0.0023	0.011	0.0011	0.001	Rem.

- Scrap wheel was selected with high Fe content. In this way, both the increase of the secondary source and the effect of high Fe can be observed.

Results and Discussions

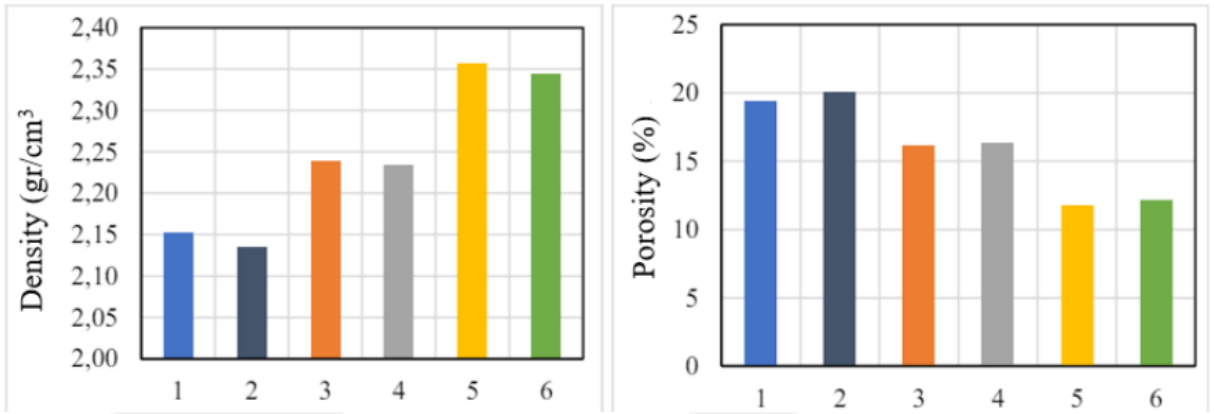


Fig 3. Density and Porosity Measurement

- Density increases as Fe content increases and porosity tends to decrease.

Results and Discussions

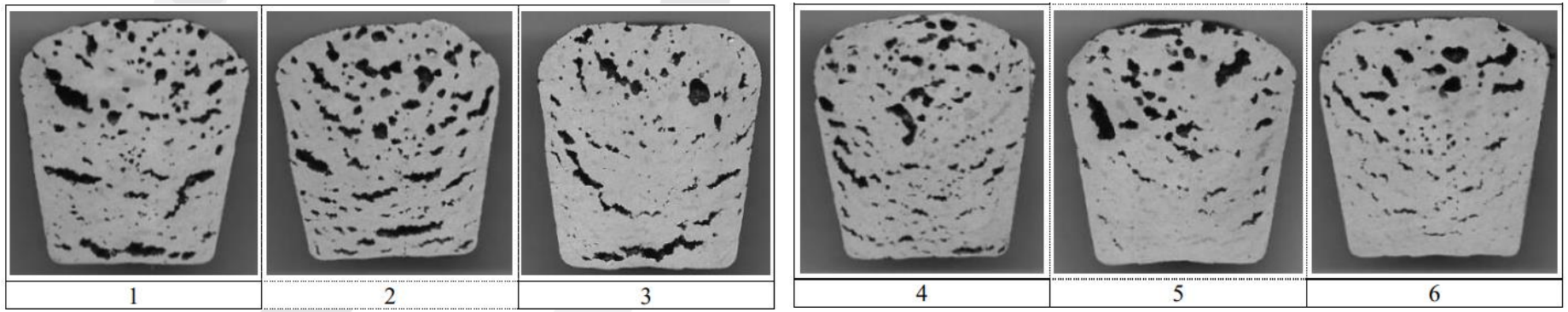


Fig 4. RPT Samples

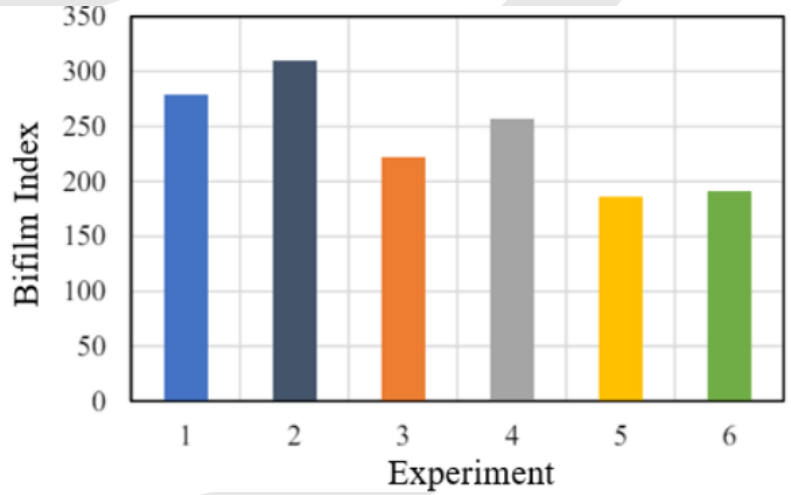


Fig 5. Bifilm Index Measurement

- There is a tendency for the bifilm content to decrease as the proportion of scrap wheels increases.

Results and Discussions

Table 4. Tensile Test Results in Different Position

Exp.	Position A			Position B			Position C		
	Yied Strength (MPa)	Tensile Strength (MPa)	Elongation (%)	Yied Strength (MPa)	Tensile Strength (MPa)	Elongation (%)	Yied Strength (MPa)	Tensile Strength (MPa)	Elongation (%)
1	94.95	157.86	3.02	91.68	140.69	2.53	91.76	138.26	2.26
2	89.74	155.32	2.54	90.91	139.30	2.28	86.76	133.59	2.32
3	89.67	140.14	2.16	88.40	126.53	1.75	88.27	138.62	2.13
4	91.52	131.76	1.51	90.21	128.78	1.66	88.21	128.78	1.57
5	85.76	138.73	2.11	86.43	127.47	1.60	84.97	127.47	1.75
6	90.21	134.02	1.60	93.30	140.45	1.74	92.29	144.75	2.03

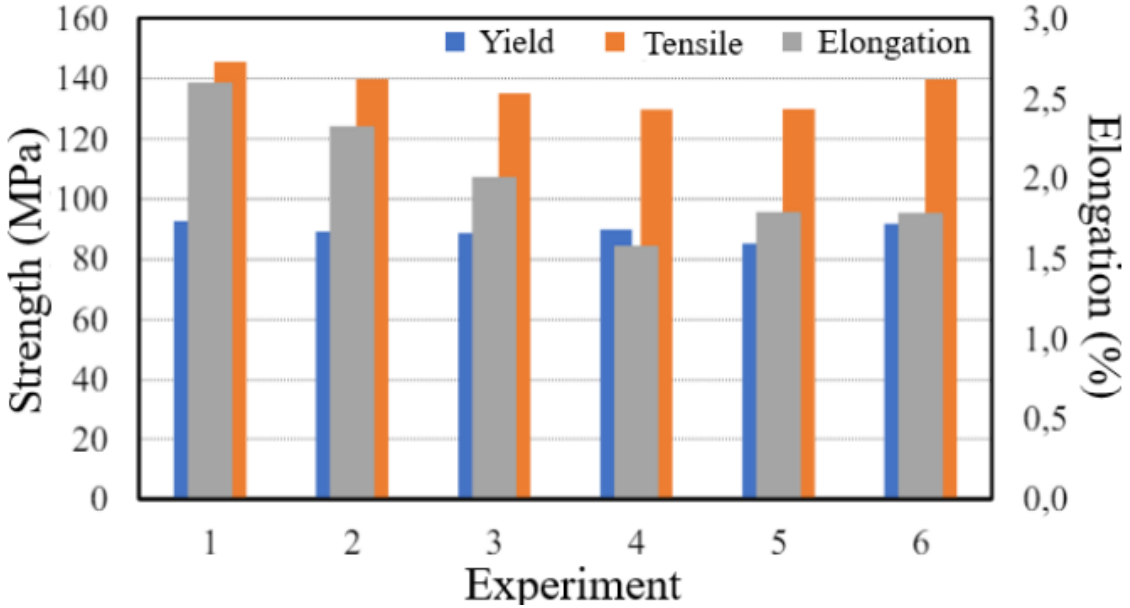


Fig 6. Tensile Test Results

- There is a decreasing tendency in elongation as the scrap wheel ratio increases.
- Specimen in the outer cross-section has slightly higher values due to faster solidification compared to the other specimens.

Results and Discussions

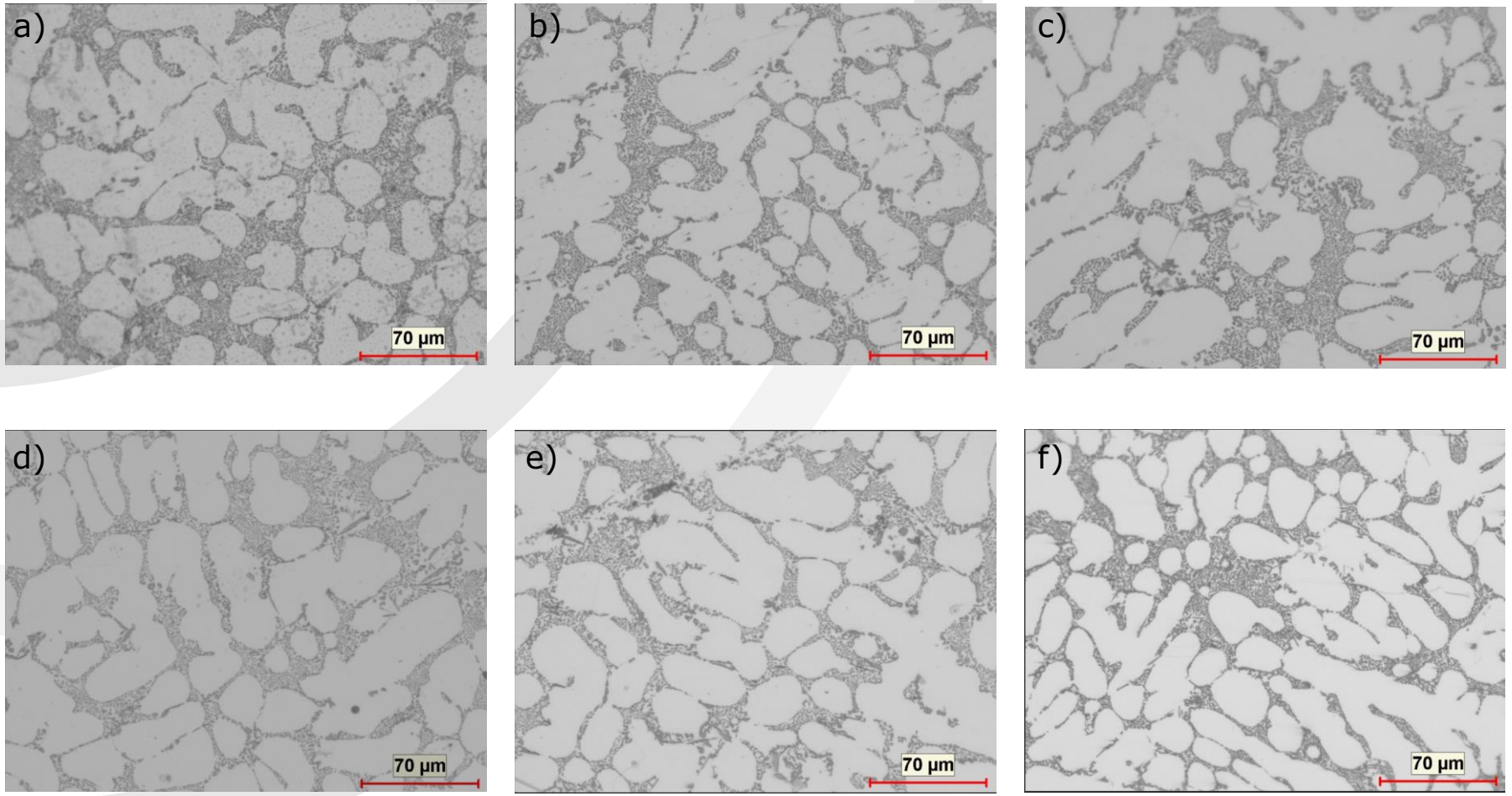


Fig 7. 200X Microstructural Results of Samples

- There are Fe-rich phases on the microstructure especially experiment 4, 5, and 6.
- These phases are so harmful for elongation.

Results and Discussions

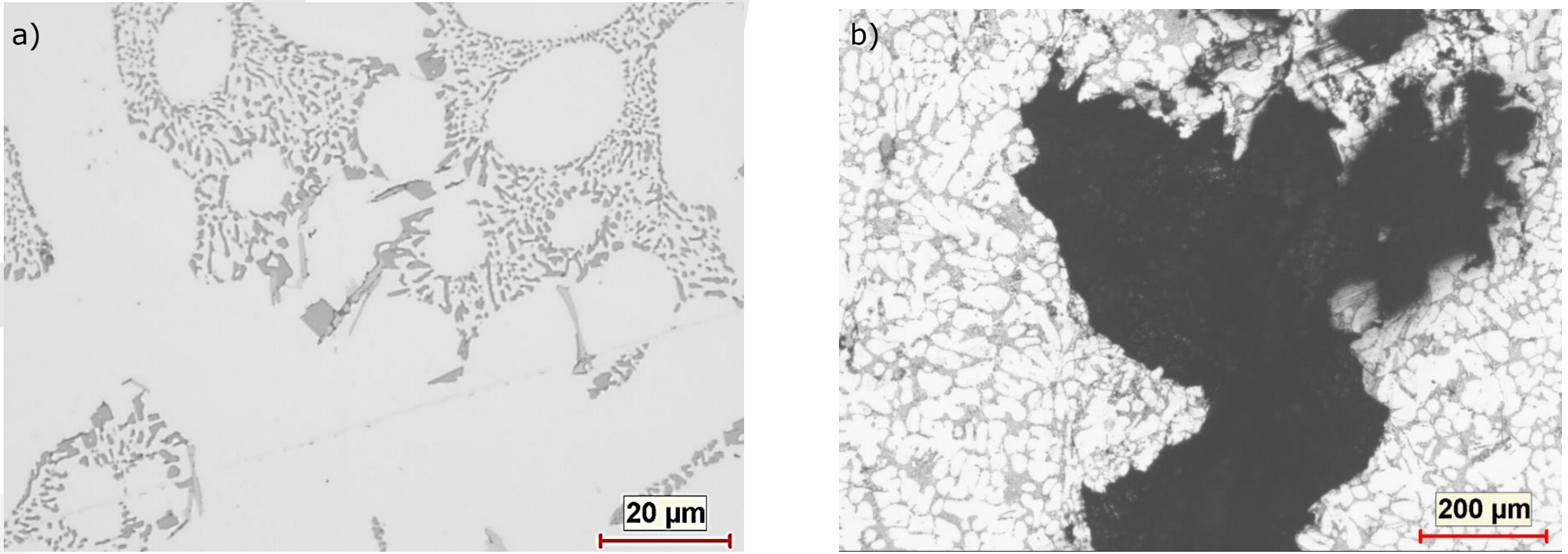


Fig 8. a) Fe Rich Content and **b)** Shrinkage Porosity of Experiment 4

- There is Fe rich phase and unexpected shrinkage porosity for experiment 4. That's why the lowest elongation is in experiment 4.

Results and Discussions

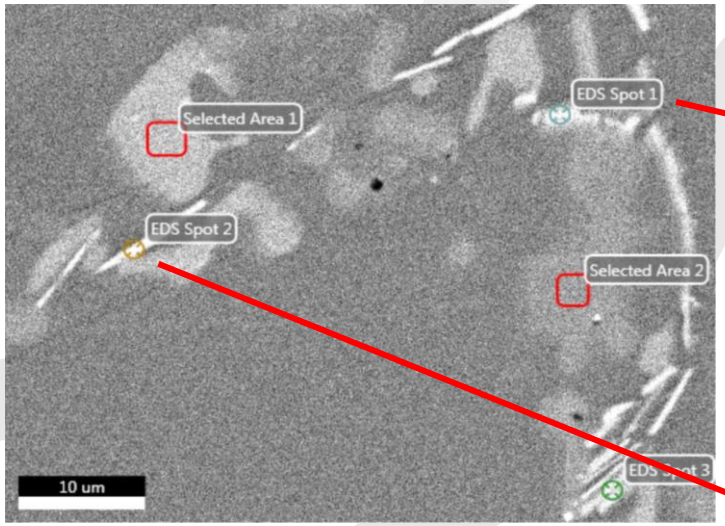
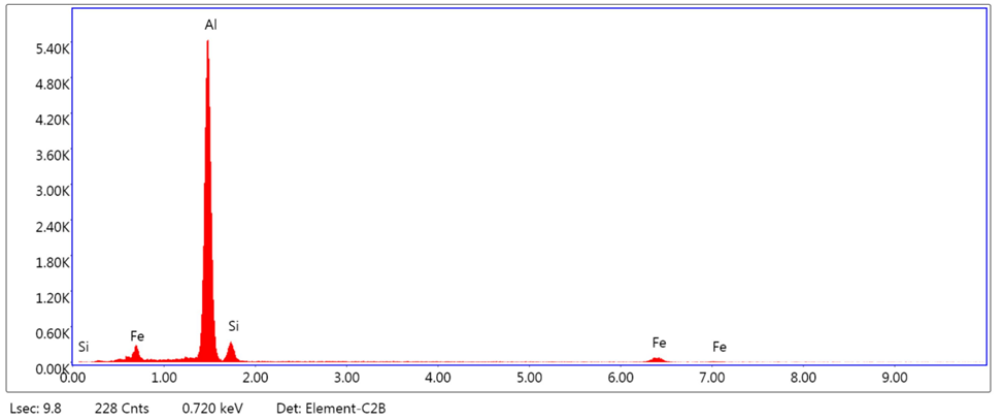
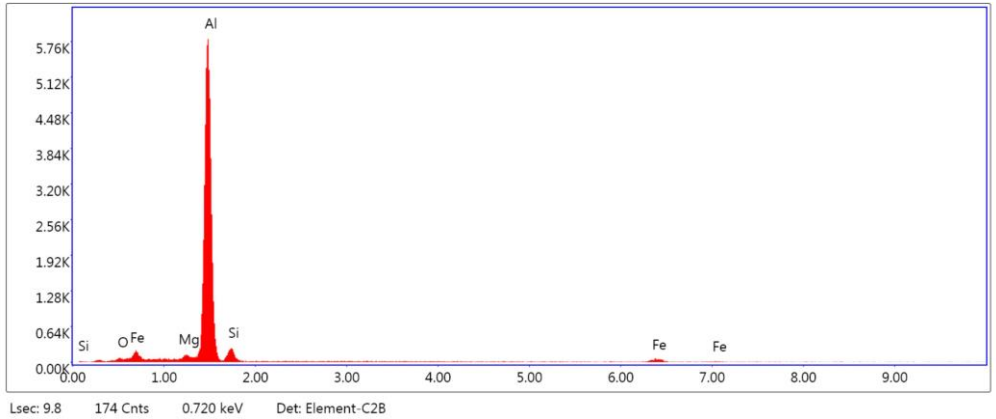


Fig 9. 200X Microstructural Results of Samples





- SEM results show that there is Fe content in microstructure.

Conclusion

- In the study, since there was no liquid metal cleaning in the casting tests, it was determined that the density values were low in all experiments and the amount of pores was quite high above 10%. It was determined that liquid metal cleaning was required in RPT sample cross-sectional surface images and bifilm examinations. This situation shows that liquid metal cleaning is necessary when using scrap alloys.
- Mechanical test results showed that the highest tensile strength was 145.61 MPa in experiment 1 and the lowest results were observed in experiments 4 and 5 with approximately 129 MPa.
- In the yield strength results, the highest strength with 92.8 MPa was obtained in the experiment 1 using 100% chips scrap, and the worst result was obtained with 85.19 MPa in the experiment 5 with high Fe content. The yield strengths in Experiments 2, 3, 4 and 6 are 89.23 MPa, 88.78 MPa, 89.98 MPa and 91.93 MPa, respectively.
- When the elongation values were analysed, it was seen that the values varied between 1.58% and 2.6% and the lowest elongation value was obtained in experiment number 4.
- Fe content was found to be the most important factor in mechanical test results. Depending on the increase in Fe content, a decrease in mechanical values was encountered. Although 100% scrap wheel scrap had the highest Fe content, it did not encounter the worst results in the results. It is thought that the reason for this may be due to the impurities coming from the chips scrap in the structure affecting the Fe intermetallic formation.

Questions

THANK YOU FOR YOUR ATTENTION

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