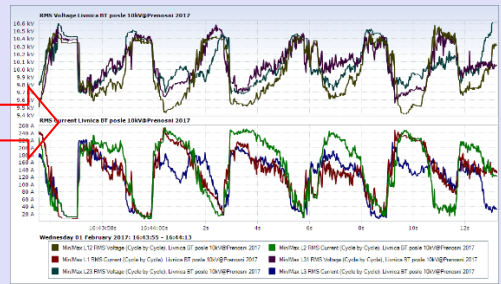
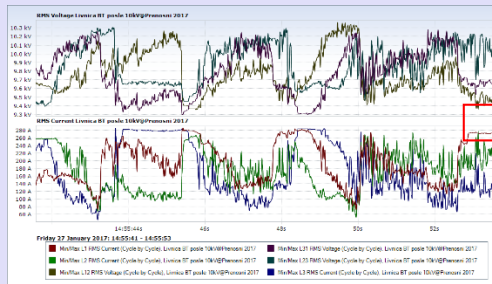
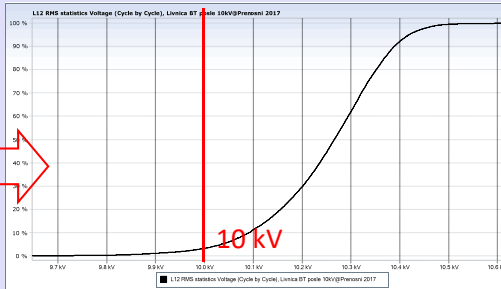
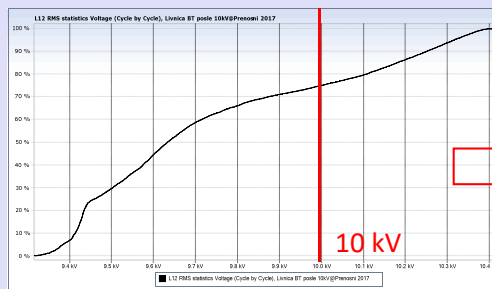


Date	Technology	Sector	Location (Country, City)
20-04-2018	EAF power factor correction	Metalurgy	Serbia

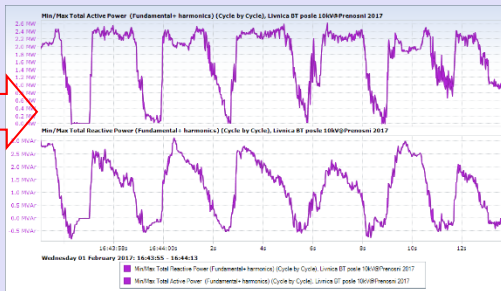
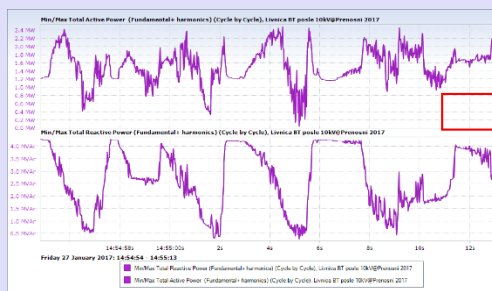
Title of the case study	Hybrid power factor correction of Electric Arc Furnace																								
Case Study Summary (1-500 characters)	A power factor correction of 5 t, 3 MVA/10 kV Electric Arc Furnace has been performed in an innovative way that makes it feasible to control reactive power flow of a relatively small EAF. Up to now classical solutions like STATCOM, SVC,... had been too expensive for small furnaces, which means those EAF are suffering from big voltage drop, reduced efficiency, high disturbance injection, etc.. Avalon Partners engineering team designed a solution that is financially viable and technically capable to reduce disturbance injection and voltage drop. The voltage rms stabilisation yields an increased energy input into the furnace, which reduces tap to tap time increasing EAF efficiency. This case study proved excellent results in all segments of furnace operation.																								
Advantages and Innovations (50-2000 characters)	Innovation improves energy efficiency of the small power Electric Arc Furnace, increasing heat input for the same working current and reduces melting times. At the same time disturbance injection into the grid is reduced to acceptable levels.																								
Technical Specification	1-20 MVA, 6-35 kV, 50/60 Hz																								
Detailed Description of Case Study (100-4000 characters)	<p>Case study had been performed on a 5 t, 3 MVA/10 kV, 50 Hz Electric Arc Furnace. Case study compared main electrical parameters before and after commissioning a hybrid PFC, as outlined in table below:</p> <table border="1"> <thead> <tr> <th></th> <th>Maximal power [MW]</th> <th>Power¹⁾ [MW]</th> <th>Voltage²⁾ [kV]</th> <th>Power factor</th> <th>EAF capacity [taps/day]</th> </tr> </thead> <tbody> <tr> <td>Before</td> <td>2.4</td> <td>>1.18</td> <td>>9.37</td> <td>0.78</td> <td>4.5</td> </tr> <tr> <td>After</td> <td>2.6</td> <td>>1.41</td> <td>>10.03</td> <td>0.99</td> <td>5.2</td> </tr> <tr> <td>Difference</td> <td>+8.3%</td> <td>+19.49%</td> <td>+7.04%</td> <td></td> <td>+15.56%</td> </tr> </tbody> </table> <p>¹⁾75% of all samples ²⁾95% of all samples</p> <p>Voltage drop had been significantly reduced due to fast response times and sufficient reactive power capacity. Below diagrams show voltage and current rms before and after commissioning the PFC.</p>		Maximal power [MW]	Power ¹⁾ [MW]	Voltage ²⁾ [kV]	Power factor	EAF capacity [taps/day]	Before	2.4	>1.18	>9.37	0.78	4.5	After	2.6	>1.41	>10.03	0.99	5.2	Difference	+8.3%	+19.49%	+7.04%		+15.56%
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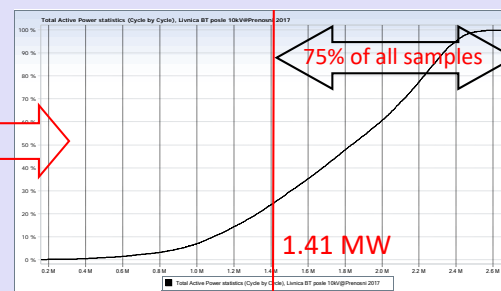
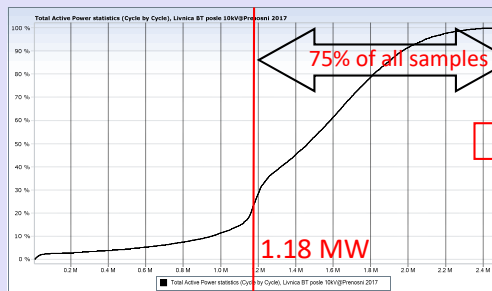
Statistical analysis show significant improvement in voltage profile, i.e. an average voltage rms had increased for 7,04%. After PFC 96% of all voltage samples had been positioned above 10 kV.



Voltage profile stabilisation positively influences active power input into the furnace, as shown below (active and reactive power).



The active power profile improves so that 75% of all power samples had been positioned above 1.41 MW, compared to 1.18 MW before PFC.



As a final result company was able to increase average number of taps per day from 4.5 to 5.2, which is a capacity increase of more than 15%.

Technology Keywords	Electric Arc Furnace, power factor correction, voltage drop, STATCOM
Certification of Technology	