Figure 1: Physical principal of electrodynamic fragmentation by the reduction of pulse rise time to increase the breakdown voltage of water.

Discharge process

Formation of the electrical field

Plasma streamer creation and growth

Plasma arc by bridge of streamers between electrode

Plasma channel expansion due to Ohmic heating

Plasma channel collapse

Figure 2: Effects of the electrodynamic process to water and solids in a evolving electrical field to a discharge.
Table 1: Description of available samples available for WP 1 & 2

<table>
<thead>
<tr>
<th>Send to Partner</th>
<th>Label</th>
<th>Type of composite</th>
<th>Type of fiber</th>
<th>Samples setup</th>
</tr>
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<tbody>
<tr>
<td>SELFRAG</td>
<td>TSC01</td>
<td>Thermoset Composite</td>
<td>Continuous and long fibers</td>
<td>19</td>
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<tr>
<td>SELFRAG</td>
<td>TPC01</td>
<td>Thermoplastic Composite</td>
<td>Continuous and long fibers</td>
<td>18</td>
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<tr>
<td>SELFRAG</td>
<td>CHP01</td>
<td>Composite thermoplastic Chips pressed</td>
<td>Non-continuous and long fibers</td>
<td>9</td>
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</tbody>
</table>

Figure 3: Figure 3: Samples used for the process development. Lab scale tests of WP 1 & 2 used upper left in dimension 40x40 mm. Below left was used to test large forms in Plant D setup in WP 3. Right shredder sample was used in WP 3 in plant E setup.
Figure 4: SELFRAG LAB equipment used for the tests of WP 1 & 2.

Size reduction at 90 kV and 20 mm gap

Figure 5 Typical size reduction pattern of CFRP in the process at different conditions – in this case different electrode sizes.
Figure 6: Size reduction of thermosets using high (left) and low (right) voltages at comparable energy input.

Figure 7: Tests in open and closed circuit design at different filling grades in g and CFRP material.
Figure 8: Door hinge processed with chopped tapes and electrodynamic recycled fragments. Pictures provided by M. Roux FHNW, Switzerland).

Figure 9 SEM pictures of a fragment after electrodynamic fragmentation (a), Fragment surfaces with fiber fully covered with thermoplastic polymer (b), partially covered by polymer (c) and free of polymer (d). (Roux 214)
Figure 10: Left: typical load/deformation for the tested rotorcraft door hinges. Right: graphic of the maximal load of door hinges made with granules, recycled chips and chopped tapes (Roux 2014).

Figure 11: SEM pictures to C-fiber liberated by electrodynamic fragmentation (pictures provided by Fraunhofer IBP).
Figure 12: Micrographs to different magnification from C-fibers liberated from thermoset composites by electrodynamic fragmentation. Picture provided by M. Roux, FHNW, Switzerland.
Figure 13: Conceptual flow-sheet of CFRP demonstrator in Plant E design to treat thermoplast PEEK and thermosets -60 mm.

Figure 14: Flexible process zone and demonstrator circuit setup to treat larger shaped particle
Figure 16&15: Construction of plant components including process zone.
Figure 17: Overview of actual SELFREG plant and parts of post processing using a screen before filter fines. Oversize is collected in buckets.
Figure 19: Feed/product correlation of optimization tests.

Figure 16: Equipment setup for large CFRP material.