GREY WATER RECYCLING AND ENERGY RECOVERY

A completely integrated circular economy approach
A proven technology

derived from space research with several terrestrial applications

A technology derived from a research work carried out by FIRMUS France for the European Space Agency (ESA)

The design, implementation and operation monitoring of a process in service since 2005 on the French-Italian Antarctic station Concordia

More than 1,200 users since commissioning without any technical or sanitary incident
### Results

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<tbody>
<tr>
<td>C.O.T</td>
<td>mg/L</td>
<td>10</td>
<td>222</td>
<td>3,0</td>
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<tr>
<td>Chlorure</td>
<td>mg/L</td>
<td>200</td>
<td>65</td>
<td>0,93</td>
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<tr>
<td>Nitrate</td>
<td>mg/L</td>
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<td>0,7</td>
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<tr>
<td>Phosphate</td>
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<td>Ammonium</td>
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<td>15</td>
<td>0,7</td>
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![Graph showing water quality parameters](chart.png)

### How to enhance this expertise?
A global viewpoint

A consortium to provide a customized optimal solution

**Technology**
Sizing, design and development of the FGWRS® process

FGWRS: Firmus Grey Water Recycling System

**Engineering**
System integration and design of the energy recovery solution

**Optimization**
Modeling, simulation and optimization of the circular system

**Legislative**
Ensure the compliance with legislation and quality monitoring of the produced water

The development of this recycling process requires a system integration by an expert team.
Our vision

- Combat against water stress
- Fight climate change
- Contribute to water and energy autonomy
Our approach

- Need analysis
- Water and energy cycle
- Objectives and constraints
- Parametric study and scenarios

- Regulation
- Architectural constraints
- Grey water quality
- Usage and quality of the recycled water
- Recycling rate
- Occupancy rate (optimist/pessimist)
- Recycling rate
- Usage choice
- Equipment sizing and optimization
Key Features

- Recycle up to 80% of grey waters to obtain hygienic quality water for toilets and the sanitary network.
- Optimize profitability through energy recovery to contribute to the building heating needs.
- Achieve a significant savings potential both in terms of operating costs and use of the resource.
- Allowing reuse for all purposes, except drinking (1% of the daily needs) thanks to the quality of the produced water.
Design phase

- Design and validate the control system
- Design and optimization of the energy management system
- Sizing: FGWRS, storage, heat pump
Exploitation phase

- Simulate the operational scenarios
- Evaluate consumption and profits for several configurations and architectures
- Master and manage a complex, multi-view, circular system
- Improved communication and collaborative work
Thank you FOR YOUR INTEREST