PHOSave
Deliverable D7.2
Training program and materials

Partner responsible:

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Participant organization name</th>
<th>Short name</th>
<th>Country</th>
<th>Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ProPHOS Chemicals S.r.l</td>
<td>ProPHOS</td>
<td>Italy</td>
<td>SME</td>
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</table>

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Summary

This document sets out the strategy and options for training the user groups within the PHOSave project, aiming to create trainings for the following users: fire extinguisher service companies, fertilizer companies, wood panel producers and internal staff. Training activities range from workshops to 1 on 1 tutorials and courses for students.

Introduction

The deliverable D7.2 is a public document delivered in the context of WP7, Task 7.3 “Free training seminars” with regard to the dissemination of the project results. This document is an overview about what ProPHOS Chemicals will organize and use to explain the PHOSave project when the industrial pilot plant will be installed. In particular free training seminars, organized with the support of HHL, will be provided for customers and students. It will be a 2 hour seminar on the issues of waste management and recycling of phosphorous recovered from exhausted extinguishing powders, with demonstrative visits of the pilot plant. There may be a max of 2 participants per company, with a total of max 20 participants. ProPHOS will identify and select several institutions and companies to be involved for the training sessions. The targeted audience addressed by this action will be interested in expanding their skill sets for professional, personal and environmental protection knowledge levels. In addition, they can improve their overall competitiveness and enterprise based sustainability.

Direct meetings with the company representatives will promote their active participation in the collection of exhausted extinguishing powders (waste). In making these meeting arrangements ProPHOS will provide technical support and at the end of the meetings, a questionnaire of satisfaction, developed by HHL, will be distributed. Timing will entail one annual visit made by an ecological facilitator to support the promotion of the good environmental practice proposed by the project. Location will be at the companies that separate and collect the material.

PHOSave project involves several targets with different backgrounds and needs. In order to facilitate understanding, information must be selected considering different users, using an adequate “language” that makes clear objectives and advantages of the recovery. The more intuitive the training materials are, the quicker the users can learn, apply and consequently communicate to other possible interested ones. Understanding target requirements and expectations and set them as a baseline for preparing customized training materials helps to achieve this goal.

PC presentations are an effective way to communicate information both written and graphic. Moreover, they can be shared easily, thus facilitating the spread of the project material.

The leaflet of the event and a general presentation that will be used for the training seminars, are hereafter reported. Since Italy is our initial target scenario, an Italian version is prepared besides the English one in order to facilitate the communication.
Leaflet of the event (English)

PhOSave®

TOGETHER
WE CAN SAVE THE ENVIRONMENT

TRAINING SEMINAR

ProPHOS Chemicals S.r.l.
Via Castelletti 20
San Giovanni in Croce (CR)

PROGRAMME

Welcome 9:00
Project presentation 9:15
Questions and discussion 10:00
Coffee break 10:30
Visit to the pilot plant 10:45
Customer survey 11:45
End of the training 12:00

Dr. Marco Michelotti will coordinate the event

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PHOSave – Innovative solution for phosphate recovery from exhausted extinguishing powders

PowerPoint Presentation (English)

ProPHOS Chemicals

Dr. Marco Michelotti

http://en.prophoschemicals.com

Our Vision

“We want to be a Green chemical company, which invests in research to develop innovative products and services, customized for the customer, while respecting the values of Sustainability and Ethics of Work.”
Innovative solution for phosphate recovery from exhausted extinguishing powders

This project has received funding from the EU’s Horizon 2020 research and innovation programme under Grant Agreement No - 724586

Objectives

- Developing *an innovative eco-compatible method for removing the silicon component* from exhausted extinguishing powders;

- Implementing *an industrial plant* for the treatment of this waste, recovering monoammonium phosphate;

- Obtaining *raw materials* for the formulation of *specialty fertilizers* for agricultural use, and for the production of *flame retardants* in the wood sector;

- Achieving further *environmental benefits* in terms of reduced greenhouse gas emissions.
PHOSPHORUS is essential to life!!!

The global phosphate demand is rising due to a growing world population and associated food demand, increasing the demand for phosphate fertilizers.

Industrial Problem

<table>
<thead>
<tr>
<th>ABC Extinguishing Powder</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monoammonium Phosphate</td>
<td>40.0 %</td>
</tr>
<tr>
<td>Ammonium Sulfate</td>
<td>55.0 %</td>
</tr>
<tr>
<td>Silicone Oil</td>
<td>&lt; 0.5 %</td>
</tr>
<tr>
<td>Dyes</td>
<td>&lt; 0.5 %</td>
</tr>
<tr>
<td>Additives</td>
<td>&lt; 1.0 %</td>
</tr>
</tbody>
</table>
**Sampling and Analysis Protocol**

- Spectrum Two
- Lambda 365
- STA 6000
- MCR Rheometer
- Helos BR
- Titan MPS
- Optima 8000
- GC 7890 MS/MS
- HPLC Altus 10

**Mechanical Treatment**
Primary (Mechanical) Treatment

Homogenization
**European Patent**
EP 11166044.5

Exhausted Extinguishing Powder

Acetone

Water

Filtration

Liquid Fertilizers

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**European Patent**
EP 11166044.5

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentration</th>
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<tbody>
<tr>
<td>Total nitrogen (as N)</td>
<td>310.8 mg/kg</td>
</tr>
<tr>
<td>Phosphorus (as P₂O₅)</td>
<td>5119 mg/kg</td>
</tr>
<tr>
<td>Silicon</td>
<td>125 mg/kg</td>
</tr>
<tr>
<td>Silicone oil</td>
<td>n.d (*)</td>
</tr>
<tr>
<td>Dyes</td>
<td>n.d (*)</td>
</tr>
<tr>
<td>Additives</td>
<td>n.d (*)</td>
</tr>
<tr>
<td>Dry residue</td>
<td>20.24% w/vol</td>
</tr>
</tbody>
</table>

(*) below the detection threshold of the instrument i.e. <5 mg/kg
Removing Color and Heavy Metals

**Sorbents**
(clay, zeolites and organic matter)

Over Time
**Biological Treatment**  
IP 102016000108478

- Yeasts
- or
- Bacteria

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**Pressofiltro®**  
Agitated Nutsche Filter Dryer

cGMP compliant design  
PED 97/23/EC compliant and/or ASME VIII, with U-Stamp  
Combines mechanical (Filter) and thermal (Dryer) separation

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PHOSave – Innovative solution for phosphate recovery from exhausted extinguishing powders

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Liquid Fertilizers

Magnetic Materials

Zeolites

Magnetic Materials

<table>
<thead>
<tr>
<th>METAL</th>
<th>LocM</th>
<th>PRE-treatment</th>
<th>POST- treatment</th>
<th>D.Lim 152/06 All. 5 Tab 2</th>
<th>Method</th>
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</thead>
<tbody>
<tr>
<td>Au</td>
<td>µg/l</td>
<td>66.9</td>
<td>2.4</td>
<td>10</td>
<td>EPA</td>
</tr>
<tr>
<td>Mn</td>
<td>µg/l</td>
<td>927</td>
<td>22.4</td>
<td>50</td>
<td>EPA</td>
</tr>
<tr>
<td>Fe</td>
<td>µg/l</td>
<td>4216</td>
<td>36</td>
<td>200</td>
<td>EPA+POM</td>
</tr>
</tbody>
</table>
Figure 12 - Impact percentages related to the whole process.
Providing a one-to-one training seminar would be unrealistic, but providing a slightly different presentation is mandatory to differentiate and satisfy the needs of the user groups. Indeed each target has different objectives and role in the project. A fire extinguisher service company for example, may require a set of operative instructions to properly collect and dispose the waste.

**Operating Modes**

- Avoid mixing *ABC powders* with *BC powders*;
- The powder must be delivered in an *undamaged Big Bag (including braces and pallets)*. The powder should *not be placed in other bags* inside the initial bag;
- In the Big Bag there must be only extinguishing powder and *not other materials* (e.g. plastic/metal parts, paper, valves and fire extinguisher components);
- The Big Bag must be *stored in a suitable place* (not outdoors under adverse weather conditions). The presence of water worsens the process and falsifies the detected weight;
- It would be better from the point of view of the process, *collect the powders according to the phosphate amount* (e.g. 20%, 30%, 40%, 50%, 90%).
Fertilizer companies, require, for example, the agronomic validation test results.
Wood panel producers may be interested in the performances of the flame retardant obtained from the recovery.

The logic is that the better a presentation is, with simple text and objectives for a specific target group, the more clear the message is.
Pilot Plant

During seminars or training events, a visit to the industrial pilot plant is planned but to better understand how the reactor works, a brief demonstration of the process will be performed with the lab-scale pilot plant. The nutsche filter normally is equipped with a stainless steel chamber that works at high pressures with a thermostatic bath for controlling the temperature, but to show how it works, a transparent glass chamber will be used.
Customer Survey (English)

At the end of every training seminar, an anonymous survey questionnaire will be given in order to receive feedback. The opinions expressed by the users, will be used both to improve the next seminars and also to analyze the market needs in order to make future decisions for the company’s products.

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**Customer Survey**

Please answer the following questions by choosing only one answer.

1. **Age:**
   - [ ] < 25
   - [ ] 25 - 35
   - [ ] 35 - 50
   - [ ] 50 - 65
   - [ ] > 65

2. **Level of education:**
   - [ ] Primary School
   - [ ] High School
   - [ ] College
   - [ ] Degree
   - [ ] Higher education than degree

3. **Are you a/an:**
   - [ ] Industry
   - [ ] Farmer
   - [ ] Gardener
   - [ ] Dealer
   - [ ] Private citizen

4. **Cultivated land size in hectares:**
   - [ ] <30
   - [ ] 30 - 150
   - [ ] 50 - 80
   - [ ] 80 - 150
   - [ ] > 150

5. **Primarily crop grown:**
   - [ ] Cereals
   - [ ] Oilseeds
   - [ ] Fruit/vegetables
   - [ ] Meadow
   - [ ] Other, please specify

6. **What type of fertilizer do you buy or use most?**
   - [ ] Mineral Fertilizer
   - [ ] Organic Fertilizer
   - [ ] Organo-Mineral Fertilizer
   - [ ] Synthetic Fertilizer
   - [ ] Manure/Biomasses

7. **What form of fertilizers do you buy or use most?**
   - [ ] Granule (3-5 mm)
   - [ ] Microgranule (0.5-2 mm)
   - [ ] Powder
   - [ ] Liquid
   - [ ] Other

8. **What is the range of the fertilizer you buy or use?**
   - [ ] Less than € 300
   - [ ] Between € 300-600
   - [ ] Between € 600-900
   - [ ] Between € 900-1200
   - [ ] More than € 1200

9. **What is your favourite packaging?**
   - [ ] 10 - 25 Kg
   - [ ] 25 - 50 Kg
   - [ ] 50 - 100 Kg
   - [ ] 100 - 500 Kg
   - [ ] 500 - 1000 kg

10. **The packaging quality is not important for me.**
    - [ ] Strongly Disagree
    - [ ] Disagree
    - [ ] No Opinion
    - [ ] Agree
    - [ ] Strongly Agree

11. **What is the frequency of your orders?**
    - [ ] Weekly
    - [ ] Monthly
    - [ ] Half yearly
    - [ ] Yearly
    - [ ] > Yearly

12. **I am very satisfied with the value of your products at the price I pay for it.**
    - [ ] Strongly Disagree
    - [ ] Disagree
    - [ ] No Opinion
    - [ ] Agree
    - [ ] Strongly Agree

13. **Rate from the least important (1) to the most important (5) the factors leading to your decision.**
    - [ ] Price
    - [ ] Nutrient Content
    - [ ] Absorbability
    - [ ] Environmentally Friendly
    - [ ] Brand

**Comments:**

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Thank you very much for your feedback!