SOIL STEAMING FOR FIELD AND GREENHOUSE OPERATIONS

Luuk Runia
Asian Perlite Industries Sdn Bhd - Greenhouse Solutions Asia
Tanah Rata, Cameron Highlands, Pahang 39000, Malaysia
E-mail: luukrunia@gmail.com

1.1 The Company

Specialists in soil steaming technology and systems

- Products:
  - Steamers for agriculture
  - Industrial and horticultural applications

- Experience:
  - More than 15 years in the market
  - One of the world’s leading suppliers

- Customers:
  - More than 3,000 clients worldwide

- Partners:
  - Clemers GmbH Co KG, Germany
  - MCB, Netherlands
  - Asian Perlite Industries Sdn Bhd, Malaysia

1.2 Our Expertise

2.1 The Steam Boiler

- Efficient, high quality, and reliable technology

- Features:
  - Carbon footprint and CO₂ reductions up to 40%
  - 15% faster steam generation

- Optimized Combustion:
  - Complete combustion
  - Reduction of harmful emissions

2.2 Value Table of Steam Boiler Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Output</th>
<th>Area</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>KG 10</td>
<td>100 kg</td>
<td>24 m³</td>
<td>2.4 m³</td>
</tr>
<tr>
<td>KG 50</td>
<td>500 kg</td>
<td>50 m³</td>
<td>2.5 m³</td>
</tr>
<tr>
<td>KG 100</td>
<td>1000 kg</td>
<td>100 m³</td>
<td>3.5 m³</td>
</tr>
</tbody>
</table>

3.1 Issues

- Weed Pressure
  - Automation for cost reduction and weed-free beds
  - Crop damage prevention

- Diseases
  - Pathogens such as nematodes and parasitic organisms
  - Fungi and viruses causing crop damage, especially in horticulture

- Soil Fatigue
  - Depleted soil reduces crop yield, and besides diseases, the main reason for productivity losses
3.2 Solution

\textbf{Weed Pressure}

Automation for crop rotation and weed free beds:
Crop Damage Report

Scientifically proven:
Steam kills weeds and weed seeds effectively to up to 100%!

3.5 Results of Soil Steaming

Unsteamed

Steamed

3.6 Results of Soil Steaming

Unsteamed

Steamed

3.8 Solution

\textbf{Diseases}

Pathogens such as nematodes and weed seeds cause crop damage,
also in horticulture

Scientifically proven:
Steam is all in one:
A natural pesticide, fungicide & nematocide

3.9 Results of Soil Steaming

Unsteamed

Steamed

3.10 Results of Soil Steaming

Unsteamed

Controlled soil nematode crop and is besides diseases the main reason for productivity lost

Scientifically proven:
Steam releases blocked nutrients and helps to degrade harmful substances

3.11 Solution

3.12 Results of Soil Steaming

Unsteamed

Steamed

3.13 Results of Soil Steaming

Unsteamed

Steamed

3.14 Solution

\textbf{Weed Pressure}

Automation for crop rotation and weed free beds:
Crop Damage Report

\textbf{Diseases}

Pathogens such as nematodes and weed seeds cause crop damage,
also in horticulture

\textbf{Soil Fatigue}

Scientifically proven:
Steam solves all problems
No chemicals - RESIDUE FREE!
3.16 Advantages of Soil Steaming

- Safe annihilation of weeds and weed seeds
- Better starting position for cultivated plants
- Quick growth
- Better resistance against diseases
- Even growth
- Healthier plants with optimal expansion
- Safe and quick relief of soil from pathogens
- Curing of soil fatigue

Today, the use of hot steam is considered the best and most effective way to disinfect soil, getting soil and compost ready for planting in nurseries, greenhouses, and gardens.

3.20 Soil Steaming and Plant Health

Research shows:

**Plants on steamed soil are healthier:**

- No chem. residues
- +200% Antioxidants

= BEST Quality

3.19 Soil Steaming vs. Agrochemicals

- No residue in plants and ground water
- No risk of resistance forming
- No period of rest necessary between steaming and cultivation (depends on culture)
- No risk of poisoning soil
- Comprehensive effect against all pathogens (organisms, diseases, weeds, etc.)

Modern Soil Steaming is profitable!

Suitable for use in glasshouses, tunnels, cold frames, sand beds, as well as for outdoor and compost steaming.

4. Steaming Methods

Several methods for successful steaming available

4.1 Container / Stack Steaming

Turf steaming for large applications (tunnel size: ≈ 70m x 50m)
- 2000 kg steam/h boiler output
- Fully automatic cycle system
- Substrate is steamed in a screw conveyor and stored in a container for storage
- Substrate is steamed in a screw conveyor and stored in a container for storage
- After treatment, substrate is 100% weed free and contains free from disease and other harmful organisms.

4.1 Container / Stack Steaming

Turf steaming with high pressure boilers

4.2 c) Hood Steaming

Manual, half and fully automated systems available

4.2 Steaming

- Steaming with hoods (fully and half-automated systems available)
  - Simplification of soil steaming. Most internal laying out of sheets is not necessary, using the hood allows effective steaming
- B) Burner Steaming
  - Most efficient way to sterilize substrates with steam.
4.2 c) Hood Steaming

Example
Large aluminium steaming hood, up to 10m long for one man operation.

90° pivotal on the transport rollers and pneumatic height adjustment
Mechanically or electrically driven. Steaming depth up to 25cm.

Figs 1 - air valve
Figs 2 - air supply/steel tubes
Fig. 3 - air hoses/lexible
Fig. 4 - pneumatic raise cylinder

4.2 c) Hood Steaming

Large steaming hood for one man operation, here up to 35m² per steaming cycle. For steaming outdoor beds, the hood is hoisted by a tractor fitted with a special 4-point (4P) Steamer base 30m²/35m² depth/height.

Fully automatic steaming robot with steaming hood on wheels for green areas - INDIGA WINNER 2010

5.4 Example Substrate Steaming

- Food installed container steaming system
- 30kg/0.01 m² steam
- 30 kg steam / h and m² substrate required
- Continuous steaming process
- 24/7 operation possible

Cost of Chemical treatment compared to steam technology

Chemicals like Methyl bromide and Basimid are about
RM 1.30 per square meter.

Cost of steam sterilisation is about
RM 1.00 per square meter.

This calculation does not include the other factors benefits from steam, faster crop rotation, healthier environment for workers, destroys eggs and larvae of insect pest, no residue in ground water, weed control, over years the soil natural strength returns and farmer can steam less and longer, grow healthier vegetables, more even growth, better natural resistant against diseases. Can plant same crop over and over no soil fatigue..... Etc etc etc

Bunker steaming

Cost of Chemical treatment compared to steam technology

Chemicals like Methyl bromide and Basimid are about
RM 1.30 per square meter.

Cost of steam sterilisation is about
RM 1.00 per square meter.

This calculation does not include the other factors benefits from steam, faster crop rotation, healthier environment for workers, destroys eggs and larvae of insect pest, no residue in ground water, weed control, over years the soil natural strength returns and farmer can steam less and longer, grow healthier vegetables, more even growth, better natural resistant against diseases. Can plant same crop over and over no soil fatigue..... Etc etc etc

Bunker steaming

Cost of Chemical treatment compared to steam technology

Chemicals like Methyl bromide and Basimid are about
RM 1.30 per square meter.

Cost of steam sterilisation is about
RM 1.00 per square meter.

This calculation does not include the other factors benefits from steam, faster crop rotation, healthier environment for workers, destroys eggs and larvae of insect pest, no residue in ground water, weed control, over years the soil natural strength returns and farmer can steam less and longer, grow healthier vegetables, more even growth, better natural resistant against diseases. Can plant same crop over and over no soil fatigue..... Etc etc etc
Conclusions and suggestions:

Convince or give incentive to farmers who change to this technology (as it is cheaper than chemical)

For smaller farmers set up centres where they can steam their substrates or request to come and steam their growing area against a certain fee (job opportunities)

Get Mardi/Fama/DOA involved to set up demo farm/unit

Try to combine the implementation of biological control to reduce the chemical use.

Thank you very much for your attention!

[Signature]

[Logo]