Mobile Brick Factory

29. October 2012

Housing Manufacturing Water (HMW) Seminar 2012
Universidade Federal do Espiritu Santo (UFES)
Vitoria, Brazil

M.Sc. Eng. Jens Palacios Neffke
Manufacturing Team – HMW Joint Project 2011-2012

Members:

- Bisht, Udit  M.Sc. Global Production Engineering
- Blanco, Flavio  M.Sc. Global Production Engineering
- Hentschke, Tanja  M.Sc. Production Engineering
- Meschenmoser, Fabienne  B.Sc. Sociology
- Pham, Viet Dung  M.Sc. Industrial Engineering

Supervisors:

M.Sc. Palacios Neffke, Jens
M.Sc. Wang, Chenqing
Agenda

- Motivation
- Study Site
- Manufacturing Process
- Production Equipment
- Factory Layout
- Transport Container
- Business Plan
- Lessons Learned
Motivation

Need for strategies for the achievement of UN’s Millennium Development Goals focussing on development of sustainable housing areas and generation of income

Idea:
- Development of tools that’ll give the people ability to build a sustainable community
- Within the sphere of sustainability- economical, social and ecological aspects

Source: http://www.touring-afrika.de/images/img/suedafrika/township-kapstadt.jpg

Dimension of Sustainability
Motivation

Our approach:

- Development of a mobile solution for brick manufacturing
- Development of a technical solution for production of bricks
- Production of sustainable construction materials with local resources
- Providing a source of income for the community

Source: http://www.touring-afrika.de/images/img/suedafrika/township-kapstadt.jpg
Study Site - Scottsdene
Manufacturing process

The Product

Pressed Adobe Brick (Imperial Size)
Manufacturing Process

Manufacturing process for a pressed adobe brick
Production Equipment

Cerades Soil Disintegrator
Output- 9 m³/h
Price: 6.129,00 €

Source:
http://www.ceratec.eu/AdaptedPreparation.html
Production Equipment

- Ceramix Pan Mixer
- Output: 2.88 m³/h
- Price: 9,430,00 €

Source:
http://www.ceratec.eu/AdaptedPreparation.html
Production Equipment

Ceraram Compressor
Output: 2400 bricks per 8 hours
Price: 3.359,00 €

Source:
http://www.ceratec.eu/AdaptedPreparation.html
Factory Layout

Final Drying 1824 m²

Pre Drying 2584 m²

Incoming Goods 380.75

Production 540 m²

Materials 406 m²

Sanitation / Lunch 297.25 m²

24 m

28 m

34 m

95 m

76 m

13.5 m

14.5 m

30.5 m

Material Flow
### Production Input and Output

<table>
<thead>
<tr>
<th>Production</th>
<th>Per 1 h</th>
<th>Per 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bricks</td>
<td>2450</td>
<td>19600</td>
</tr>
<tr>
<td>Mixed Clay</td>
<td>6,3 m³ = 10,8 t</td>
<td>50,4 m³ = 86,2</td>
</tr>
<tr>
<td>Soil</td>
<td>6,7 – 8,7 t</td>
<td>53 – 69,6 t</td>
</tr>
<tr>
<td>Cement</td>
<td>0 – 0,9 t</td>
<td>0 – 6,9 t</td>
</tr>
<tr>
<td>Water</td>
<td>21,5 – 32,4 hl</td>
<td>172 – 259,2 hl</td>
</tr>
<tr>
<td>Fillings needed</td>
<td>13,125</td>
<td>105</td>
</tr>
</tbody>
</table>
Transport-Container

Outer Size [LxBxH m] 12,19x2,43x2,89
Inner Size [LxBxH m] 12,04x2,34x2,69
Weight [t] 3,9
Max Load [t] 26,58
Price [€] 2.900 (used)
Seller Vicont Trading GmbH

Source: [REF-12]
### Container- Sanitation and Office

**Toilet-Container**
- Size [LxBxH] in mm: 6058x2438x2800
- Price 6.500 €

**Office-Container**
- Size [LxBxH] in mm: 6058x2438x2800
- Price 7.300 €

Source: [CON-12]
### Business Plan

<table>
<thead>
<tr>
<th>Output</th>
<th>Selling price</th>
<th>Revenue</th>
<th>Profit/ month</th>
<th>Equipment costs</th>
<th>Amortisation time in months</th>
<th>Amortisation time in years</th>
</tr>
</thead>
<tbody>
<tr>
<td>384.000</td>
<td>1.00 ZAR</td>
<td>384.000</td>
<td>-6.094</td>
<td>930.387,38 ZAR</td>
<td>2.150,7</td>
<td>179,2</td>
</tr>
<tr>
<td>384.000</td>
<td>1.15 ZAR</td>
<td>441.166</td>
<td>19.632,60 ZAR</td>
<td>930.387,38 ZAR</td>
<td>47,4</td>
<td>3,9</td>
</tr>
<tr>
<td>384.000</td>
<td>1.20 ZAR</td>
<td>460.800</td>
<td>19.632,60 ZAR</td>
<td>930.387,38 ZAR</td>
<td>16,0</td>
<td>1,3</td>
</tr>
<tr>
<td>384.000</td>
<td>1.30 ZAR</td>
<td>499.200</td>
<td>19.632,60 ZAR</td>
<td>930.387,38 ZAR</td>
<td>6,9</td>
<td>0,6</td>
</tr>
<tr>
<td>384.000</td>
<td>1.50 ZAR</td>
<td>576.000</td>
<td>19.632,60 ZAR</td>
<td>930.387,38 ZAR</td>
<td>6,9</td>
<td>0,6</td>
</tr>
</tbody>
</table>
Lessons Learned

- Seasonal differences in the drying time of bricks
  1. Increasing the drying area
  2. Using “wet” bricks in the construction
  3. Downsizing the factory
- Interpersonal conflicts
- Fair wages
- Project image and opinions
Thank you for your attention