No Touch – No Damage

Heidrun Grycz
1920

Josef Grenzebach founded a small repair shop for agricultural machines in Hamlar.

Until 1960 he also manufactured silos, dryers and conveyor belts.
1960

Grenzebach Maschinenbau GmbH was founded.

Implementation of conveyor technology for the wood industry.
HISTORY

1962
1972

Our first market segment was created providing conveying systems for creameries and cheese fabrication.

Even today, up to 75% of all Emmental cheese production lines still include Grenzebach handling equipment.
HISTORY

Local presence secures international Business.
1988: Newnan, USA
1998: Shanghai, China
2006: Poona, India
2007: Jiashan, China
2008:
Fossano, Italy
Moscow, Russia
Taichung, Taiwan
2009:
Munich, Germany
Potsdam, Germany
2010:
Stuttgart, Germany
Athens, Greece
2011:
Detroit, Michigan USA
São Paulo, Brazil
### Grenzebach Machinery GmbH – Business Units

<table>
<thead>
<tr>
<th>Business Unit</th>
<th>Business Unit</th>
<th>Business Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Glas</strong></td>
<td><strong>Material</strong></td>
<td><strong>General Industry</strong></td>
</tr>
<tr>
<td>• Cold End</td>
<td>• Board Handling</td>
<td>• Airport Baggage Handling</td>
</tr>
<tr>
<td>• Coater</td>
<td>• Gypsum Plant</td>
<td>• Intralogistics</td>
</tr>
<tr>
<td>• Solar</td>
<td>• Wood Processing</td>
<td>• FlightSim</td>
</tr>
<tr>
<td>- Thin Film</td>
<td>• Veneers</td>
<td>• Inspection Systems</td>
</tr>
<tr>
<td>- CPV / CSP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Display</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Business Units
- **Glas**
  - Cold End
  - Coater
  - Solar
  - Thin Film
  - CPV / CSP
  - Display
- **Material**
  - Board Handling
  - Gypsum Plant
  - Wood Processing
  - Veneers
- **General Industry**
  - Airport Baggage Handling
  - Intralogistics
  - FlightSim
  - Inspection Systems
Solar Glass

Grenzebach experience covers all practical thin film and web technologies:
- a-Si  - CIGS
- a-µc-Si  - CdTe

Our worldwide deployed equipment allows to produce modules for more than 2.8 GW per year.

Moreover, technologies for the CPV (Concentrated Photovoltaic) and the CSP (Concentrated Solar Power) market were developed.
SOLAR - THIN FILM - BIPV

**Thin Film Solar Panels**

**GB-Equipment**
- Glass loading / unloading
- Conveying technology
- Handlings equipment
- Process handling
  - Marriage station
    - Butyl Application
    - Laser Edge Deletion
    - Foil trimming
  - Full autoclave loop and lamination automation
  - Hi-Pot Test
  - Inspection Systems
NON – CONTACT HANDLING

Source: Google „Miss Italia“
Non - Contact Handling

Technologies for Non-Contact Handling

• Magnet Systems (Transrapid)
• Air Bearings
• Bernoulli Principle
• Ultrasound
ULTRASOUND

• Ultrasound

Ultrasound is an oscillating sound pressure wave with a frequency beyond the upper limit of the human hearing (>20kHz)
DECISION FOR ZIMMERMANN + SCHILP

- The excess / low pressure method was due to the over pressure rejected. The risk was too high that the coating process was negatively influenced by the turbulences.

- Difficulties in terms of communication with the company.

- Maintenance cost and consumables cost on the long run lower than the compared system.
Film: First trials ZS + GB
Customised Gripper Design

- The gripper has several retainers at the side to reassure the customer that the substrate will be kept.

- Center pins were designed to avoid that the substrate will float away.

- The outer frame of the gripper is using support points which are part of the conveying system. So the gripper has a set reference which is not affected by any disturbance by the lifting to deposit the substrate properly.
Non - Contact Gripper / Customer
Non - Contact Gripper / Customer
Customised Gripper Design

• The gripper has several retainers at the side to reassure the customer that the substrate will be kept

• Center Pins were designed to avoid that the substrate will float away

• The outer frame of the gripper is using support points which are part of the conveying system. So the gripper has a set reference which is not affected by any disturbance by the lifting to deposit the substrate properly.
Non - Contact Gripper / Customer
Non - Contact Gripper / Customer
Customised Gripper Design

• The gripper has several retainers at the side to reassure the customer that the substrate will be kept.

• Pins were designed to avoid that the substrate will float away.

• The outer frame of the gripper is using support points which are part of the conveying system. So the gripper has a set reference which is not affected by any disturbance by the lifting to deposit the substrate properly.
Non – Contact Gripper / Customer
Non – Contact Gripper / Customer
Film: Ultrasound air bearing suction frame
Solutions

Damage of the substrate

Right handling of the substrate but still breakage. Risk of having put a second substrate in the graphite frame

Solution:
Sensor detection if the graphite frame is „occupied“ or „not occupied“.
Solutions

- Tests were made with 3,2mm substrates and accordingly all the adjustments
  ⇒ The 2mm substrate could not be taken out of the carrier

Solution: pneumatically controlled

- The substrate could not be taken out of the carrier
  ⇒ Adhesion

Solution: the sonotrode had three suction positions where we created a peeling process. Start in the middle and then add gradually the others
Solutions

- Lifting the substrate the glass undergoes a bending
  ⇒ The glass edge goes below the center pins

Solution: Using sleeves to extend the pins
Non – Contact Gripper – Solar Circle
Thank you for your Attention...😊

...and have an interesting forum!