Story

Brolis Semiconductors affair:

• Three brothers;
• Elite European education;
• Leading scientific results;
• Successful lab to fab conversion;
• Market-ready cutting-edge technology;

BSc Electronics
Lithuania
MSc Nanotechnology
Sweden
PhD Semiconductors
Germany
MSc Management
Belgium
Universiteit
Antwerpen

6 months: idea to funding
9 months: building the fab
2 months: working prototypes
7 months: world-leading devices

2011 06 - 12
2012 03 - 12
2013 01 - 03
2013 03 - 10

Brolis Semiconductors start-up timeline
Company

Brolis Semiconductors UAB
Molėtų pl. 73
LT-14259 Vilnius
Lietuva
www.brolis-semicon.com

Brolis Semiconductors BVBA
Bollebergen 2B
9025 Zijnaarde/Ghent
Belgium
www.brolis-semicon.com

Brolis Photonics Solutions LTD
Willowbank Business Park
Larne, County Antrim, BT40 2SF
Northern Ireland, UK
www.b-photonics.com

Business:
• Laser diodes (0.8 – 3.5 μm)
• E-O systems for defence & security
• GaSb/SOI photonic integrated circuits

Factsheet:
• Company established in August, 2011;
• Number of employees: 23 (2017)
• 210 m² state-of-the-art cleanroom facility
• ISO 9001:2015
• Revenues: 6.5 M EUR (2017)
• IP portfolio: 2 US patents granted, 3 pending
History

- 2011 m. spin-out from TU Munich, Germany
- From IDEA to the START of operations – 18 months
- From LOSS to PROFIT – 4 years
- Total investment over 10 M EUR
Target markets

Laser diode based:
- Spectroscopy
- Dermatology
- Surgery

Healthcare / Consumer electronics

Defence & Security
- Covert surveillance
- Warrior systems
- DIRCM
- NIR, SWIR, Thermal

Unique technology platform for IR wavelength range
*From material synthesis to final solutions*
- Ex-SWIR spectral range (1.7 – 3.5)
- Industrial scaling
- Developed and manufactured from **A to Z in Lithuania**

System on the Chip (Lab on the chip)

**BROLIS SEMICONDUCTORS**

**BEYOND STATE-OF-THE-ART TECHNOLOGY FOR INFRARED APPLICATIONS**

January 25, 2018
Business model: vertical integration

- Multi-wafer MBE wafer growth
- High-throughput backend technology
- System integration and assembly

From **NIR** – through **SWIR** – to **MIR**

\[ \lambda \begin{array}{c} 0.8 \, \mu m \\ 1.5 \, \mu m \\ 3 \, \mu m \end{array} \]
Financial instruments used

- Nr. VP2-1.3-ŪM-02-K-03-047
  - Intelektas LT (“soft”)
  - 2012 – 2015
  - Total project value: 944 402 EUR (EU part: 414 026 EUR)

- VP2-1.3-ŪM-03-K-03-002
  - Intelektas LT+ (hardware)
  - 2012 – 2013
  - Total project value: 3 073 663 EUR (EU part: 2 151 564 EUR)

EP2-1.3-ŪM-03-K-04-003
- Intelektas LT+ (hardware)
- 2014 – 2015
- Total project value: 1 630 888 EUR (EU part: 752 736 EUR)

EUROSTARS-2
- E10051 SWIRSENSE ranked #6 from ~300 projects from 34 countries
- 2016 – 2018
- Total project value: 380 000 EUR (EU part: 300 000 EUR)

Total financial aid: ~3.6 M EUR
Financial instruments

• Intelektas LT+, LT excellent instrument for hardware funding
• BUT not for start-ups – financial backing requirement.
• Brolis had to raise VC money to become eligible for the instrument
• VC money hard to get and most expensive in the industry
• Also a bureaucratic burden focusing on processes not the essence
• Expert reviews at times were very amateur – lack of expertise!

• Eurostars-2
• Application/review and examining is through Brussels
• International independent expert review – found remarks very valuable
• Project progress status reports – directly to EUROSTARS (MITA on cc)
• Additional bureaucracy in Lithuania – translate the same progress report with more details
• Additional review (of WHAT and by WHOM?)
• Partners in Switzerland have 0 extra bureaucracy vs Brolis having double and 3 months delay in funding.
High-tech intellectual property protection

- PATENTS are vital to protect and monetize value of know-how and technology
- PATENTS are EXPENSIVE
- PATENTS also protect the investments into the technology (relevant for FI)

- Since 2012, Brolis has 2 US patents granted and 3 more filed
- Total money spent up to now: 200 kEUR, or ~ 40 kEUR/patent
- For SME’s this is very expensive, therefore a relevant FI is necessary

- Until 2017 no long-term FI existing, or existing FI’s excluded US patents (???)
- In 2017 INOPATENTAS was introduced

**INOPATENTAS:**
- US patent included (+)
- Max funding amount/patent: 30 kEUR (+)
- Max funding intensity: 80 % (+)
- Upper limit for PA hourly rate: 120 EUR/h

This kills the entire FI!
High-tech intellectual property protection

- Patent attorney (PA) qualification are absolutely essential for the quality of the patent
- Preparing a US patent it is a good idea to work with US IP firms
- PA must specialize in a narrow field and be field-specific
- At Brolis we changed 4 IP firms in DE, UK, LT and US to find a suitable firm for our field

Market prices for a PA are:
- Top level IP firm in US: **750 EUR – 1000 EUR/h**
- Average level firm in DE, BE, UK: **500 EUR/h**
- Where does the 120 EUR/h come from?

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<table>
<thead>
<tr>
<th>Patent costs ~ 40 000 EUR</th>
<th>INOPATENTAS</th>
<th>ACTUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5000 EUR</td>
<td>30 000</td>
<td>40 000</td>
</tr>
<tr>
<td>35 000 EUR</td>
<td>80%</td>
<td>&lt;20%</td>
</tr>
<tr>
<td>Filing fees, etc.</td>
<td>120 EUR/h</td>
<td>1000 EUR/h</td>
</tr>
<tr>
<td>Patent attorney</td>
<td></td>
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This instrument will never result in anything
Money will be spent
Financial instruments: resume

- Good FI ideas but no communication/feedback with end-user
- Early stage business is left on its own in LT
- Duplication of EU bureaucracy and failing at doing so kills the FI
- Lack of local expertise leads to poor project review quality
- Lack of long-term FI’s for priority fields
- There are so many good working examples in other countries – have a look
- When creating rules of specific FI, PLEASE talk to end users
Thank You!

www.brolis-semicon.com
www.b-photonics.com