

A quantum leap in production technology..

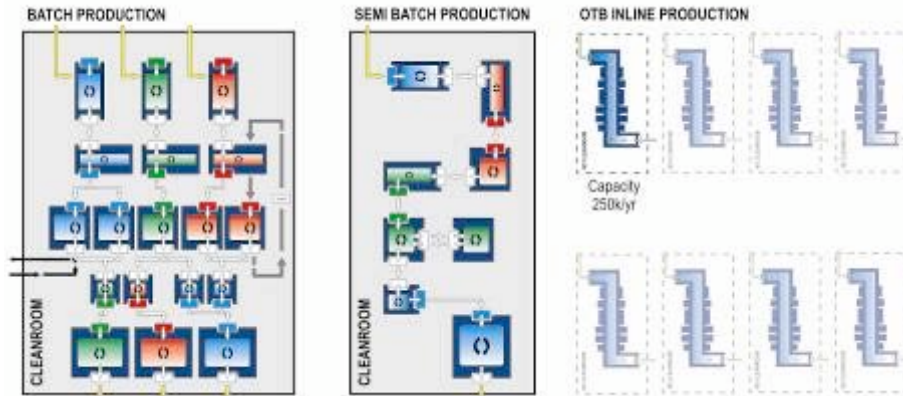
And the bumpy road to get there

Introduction OTB Group

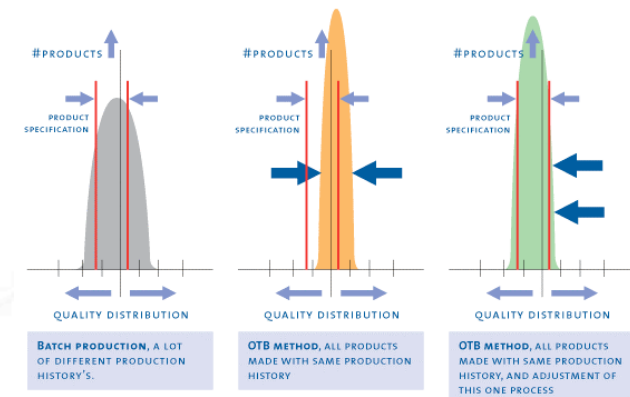
OTB GROUP				
OTB ENGINEERING	OTB SOLAR	OTB DISPLAY	PixDro	OrgaTRONICS
Research Development Tool & Proto Shop Engineering Production Purchase & Logistics Customer Support	Development Engineering Production Purchase & Logistics Customer Support	Development Engineering Production Purchase & Logistics Customer Support	Research Development Tool & Proto Shop Engineering Production Purchase & Logistics Customer Support	Development Engineering Production Purchase & Logistics Customer Support
New development Supporting other BU's Ophthalmic, Car glazing Energyhouse etc. etc.	Inline solar-cell production equipment Tabbers Anti-reflection deposition tools	Inline display equipment for SMOLED and OLED	Development of high accuracy industrial print heads Print strategy software Print material recipes	Application research for organic electronics



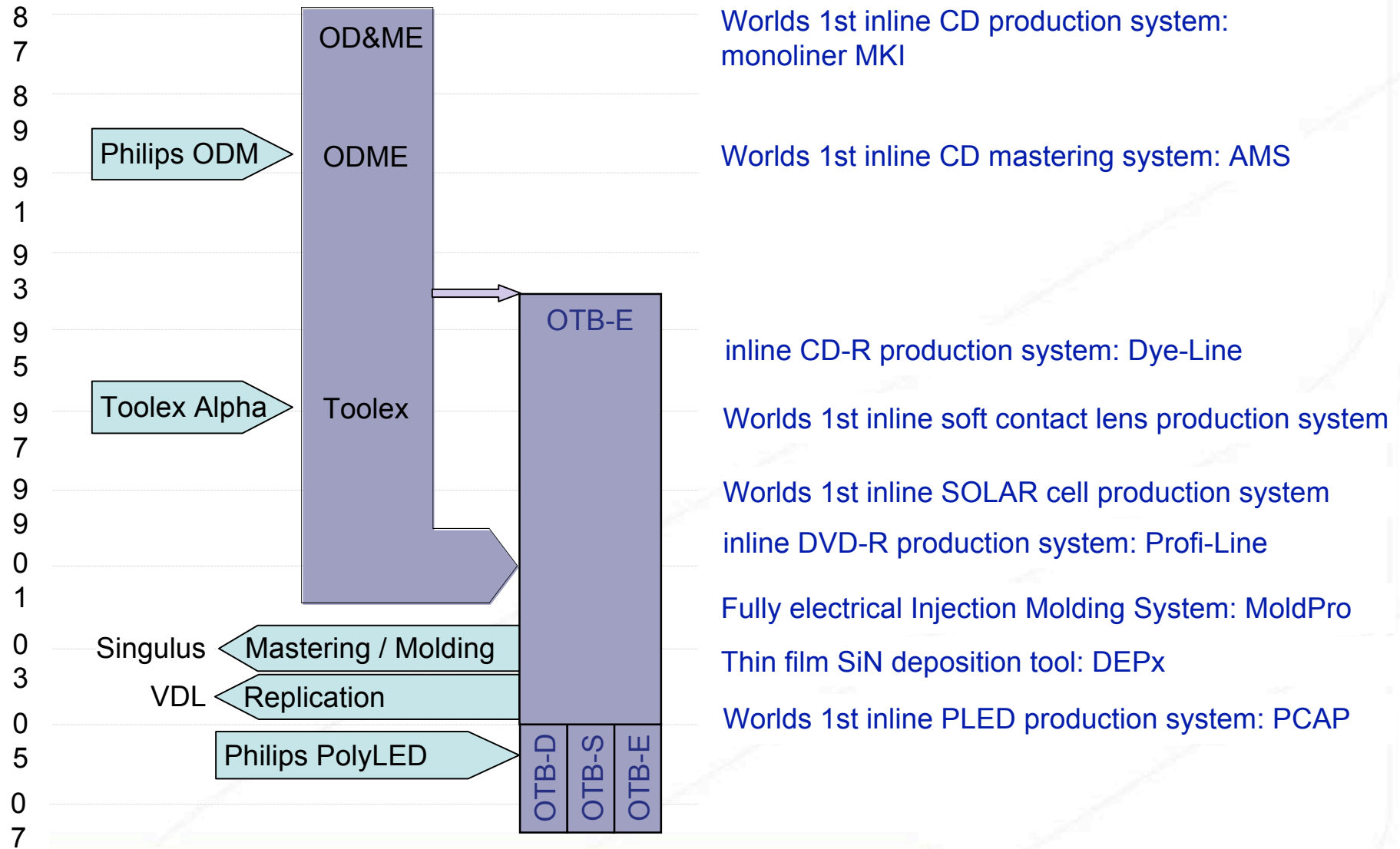
Philosophy; Inline integration



- Minimizing process steps and operator intervention
- Production equipment dedicated for a small group of products
- Balancing and reducing of tact times
- Elimination of buffers
- Integration in one machine
- Reduced inspection steps to one at the end
- Fast feed back loops enabled by short throughput times
- Maintain product orientation through process



Company evolution

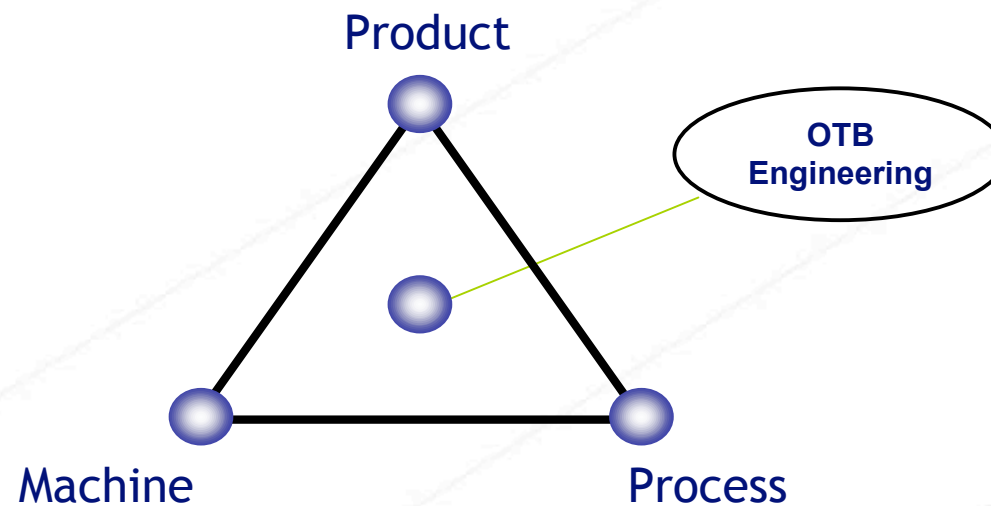


- **1968:** Started as plastics engineer at Krauss Maffei A.G.
- **1979:** Engineer at Philips Plastic Factory (laserdisc/CD)
- **1982:** Krauss Maffei Sales Office NL
- **1985:** Started Rokoma B.V.
- **1987:** First In-line production machine for CD replication MC. (OD&ME)
- **1991:** First in-line Mastering equipment and take over of Optical Disc Mastering of PDO. (ODME)
- **1995:** Sale of shares of ODME and Buy Out OTB Engineering B.V.
- **1999:** First in-line production line for PV solar cells
- **2001:** Acquisition by OTB Group of Toolex activities (former ODME operations)
- **2005:** Sales of all optical disc production units to VDL.
- **2005:** First in-line production machine for P-OLEDS

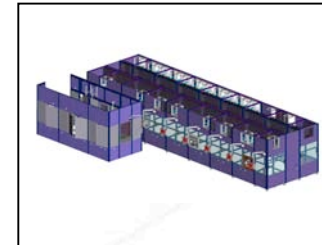


OTB Engineering

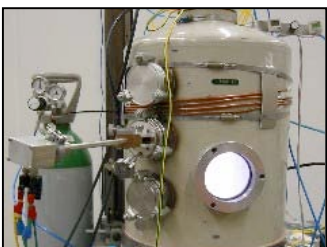
OTB Engineering is Inventing, designing, and building inline mass production equipment with a guaranteed output volume of high quality products with a low total cost of ownership



**Polymer Oled
production
machine**



**Fast SiNx
Deposition
equipment**



**Industrial
Printer**



**POP
Phase**

**Proto
Phase**

**Pilot
Phase**

**Production
Phase**



Full electric clampless molding mc



OTB Achieved results

<u>Product</u>	<u>Batch</u>	<u>In-line</u>
Solar cells	3 MW/year 160 operators 5000 m ²	50 MW/year 25 operators 100 m ²
Compact Discs	€ 3,5 / CD 20 Million/Year 400 operators 100 m ² 80% yield	€ 0,12 / CD 8 Million/year 1 operator 3 m ² >97% yield
Contact lenses	€ 0,40 / Lens 42 Million/year 25 operators 180 m ² 70% yield	€ 0,12 / Lens 42 Million/year 1 operator 10 m ² 90% yield

A microscopic view of a display panel, showing a grid of small, rectangular cells. The cells are arranged in a regular pattern and are illuminated from below, creating a warm, yellowish glow. The grid lines are dark and form a series of intersecting lines across the panel.

OTB Display

OTB Display

Designs, develops and delivers in-line production equipment including the process to manufacture OLED displays, and offers the complete display know-how.

Features of the manufacturing solution

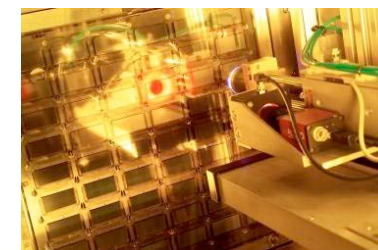
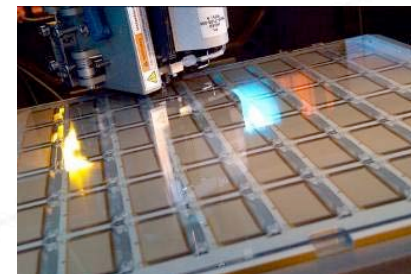
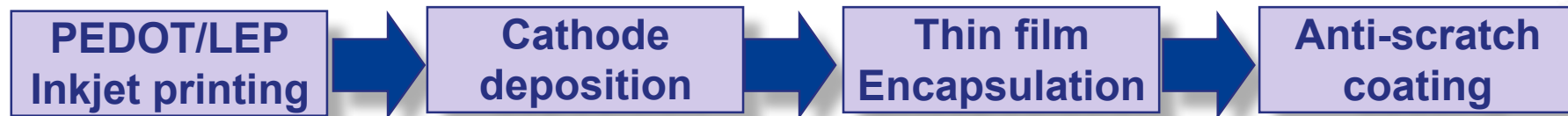
- Highly automated in-line manufacturing equipment
- An integrated process for guaranteed production volume
- Technology and support in all phases up to and incl. mass production

Benefits

OTB Display enables customers in the display industry to rapidly ramp-up to a guaranteed mass production volume against low cost

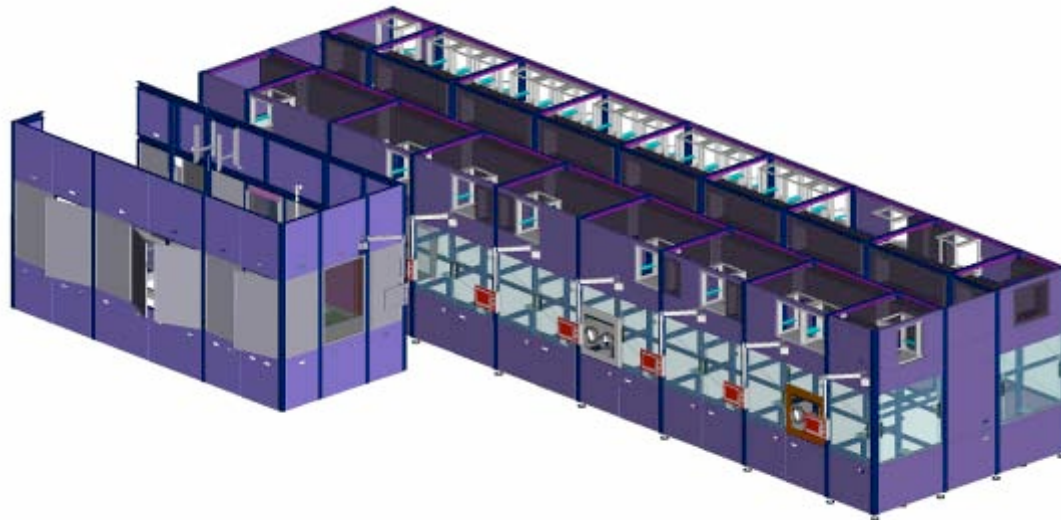
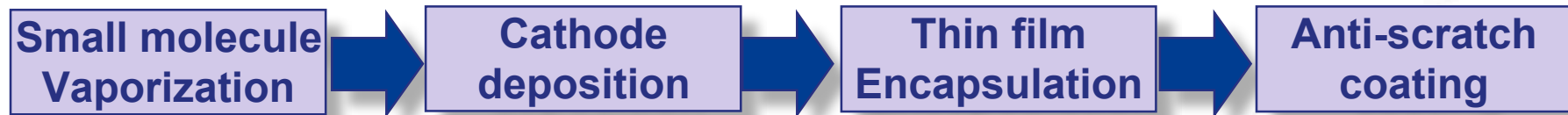
In-line p-OLED production system

In-line mass production equipment for polymer OLED displays



In-line small molecule OLED production system

In-line production equipment for small molecule OLED displays
Under development



Turn-key solution with Kodak



OLED advantages shown by samples

Comparison of LCD vs OLED display from OTB Display



1.1" OLED displays of ca. 0.7 mm thin



2.6" Full color
OLED display



1.5" Full color
OLED display



OTB Solar

OTB Solar is a leading company in the design, engineering, development and manufacturing of inline production equipment for the solar industry.

OTB Solar strategy:

- Inline concepts
- Tailor made solutions
- Breakthrough technologies
- **Partnership with customers**

From equipment delivery to process know how and After Sales support

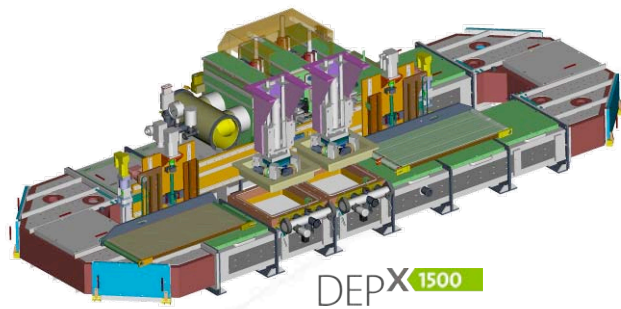
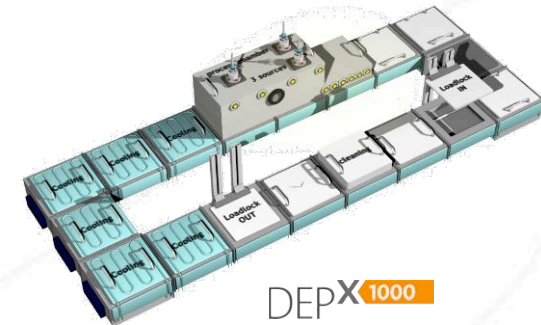
Inline Solar Cell manufacturing equipment LINE^X1400 & LINE^X1500

- Fully inline PV production platform
- Integration latest technologies:
 - Wet chemical
 - SiN deposition,
 - Screen printing processes
- Up to 1450 PV Solar Cells / hour
- Capacity up to 40 MW_{Peak} / year
- MONO & MULTI process available



Inline SiN deposition system for ARC DEP^X750 , DEP^X1000 & DEP^X1500

- Ultra fast PECVD with Linear Motor System
- Up to 1440 PV Solar Cells / hour
- Cell efficiency $\geq 16\%$ (Mono Crystalline)
- MONO & MULTI process available



- The first in-line integrator in the world, ref. Shell
- Low Total Cost of Ownership (TCO)
- Superior process know-how available
- **DEP^x** has smallest footprint
- Local support available from **OTB** offices (Eindhoven, USA, Hong Kong, India, Singapore)
- Standard **DEP^x** accommodates 125/156 mm cell sizes
- Different concepts allow different throughputs

OTB Energyhouse

Independent zero emission solutions

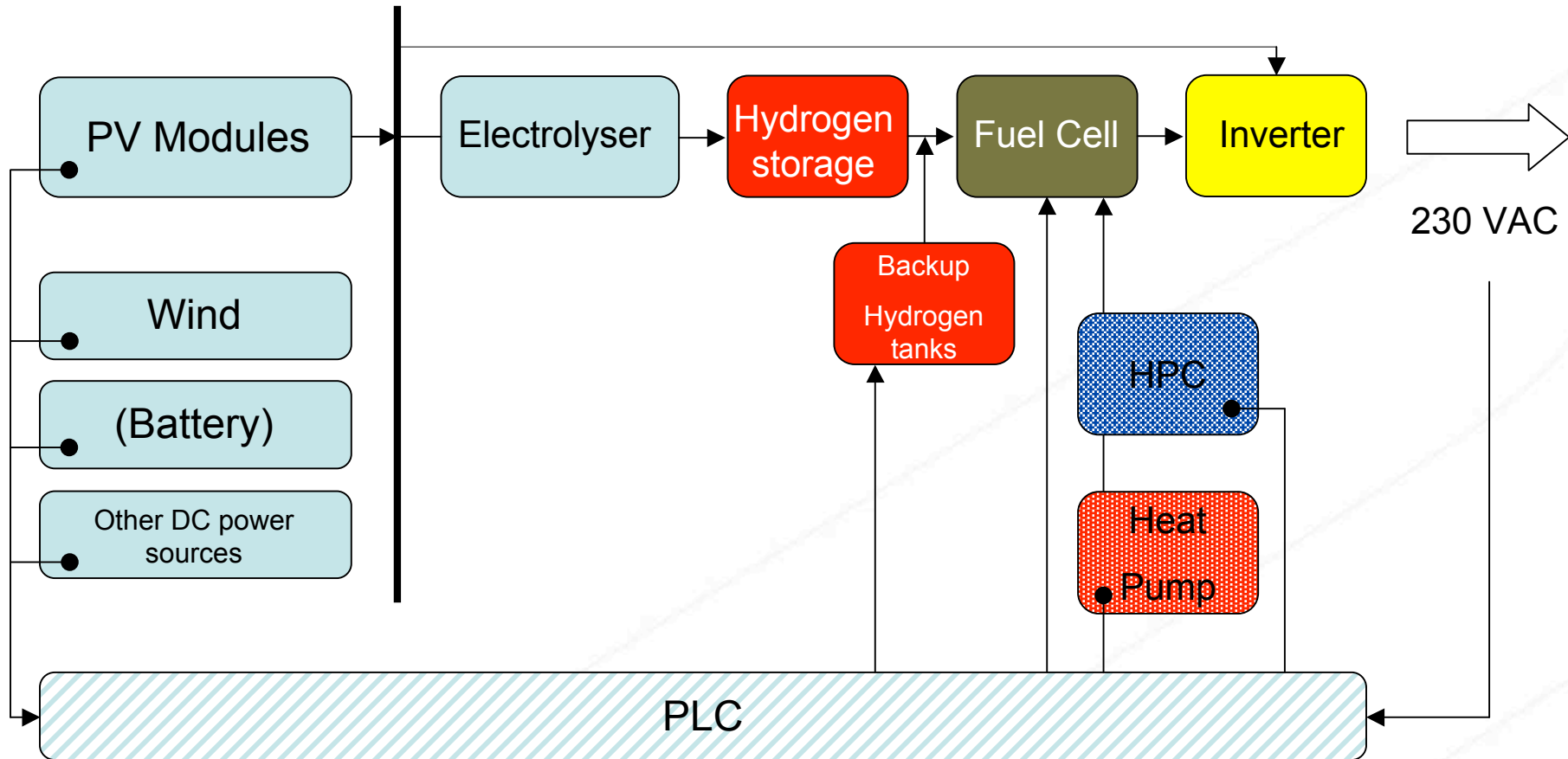
23rd January 2007, Dutch business round table, Zurich

Cees Collart, Projectmanager Energyhouse

- 2 years ago
Technology Pioneer at World Economic Forum
- Expression of disappointment about energy-politics in a forum at WEF
- Vision: from central to decentralized power generation, per individual (group of) house(s)
- Independent from gas- and electricity network
- CO₂- free

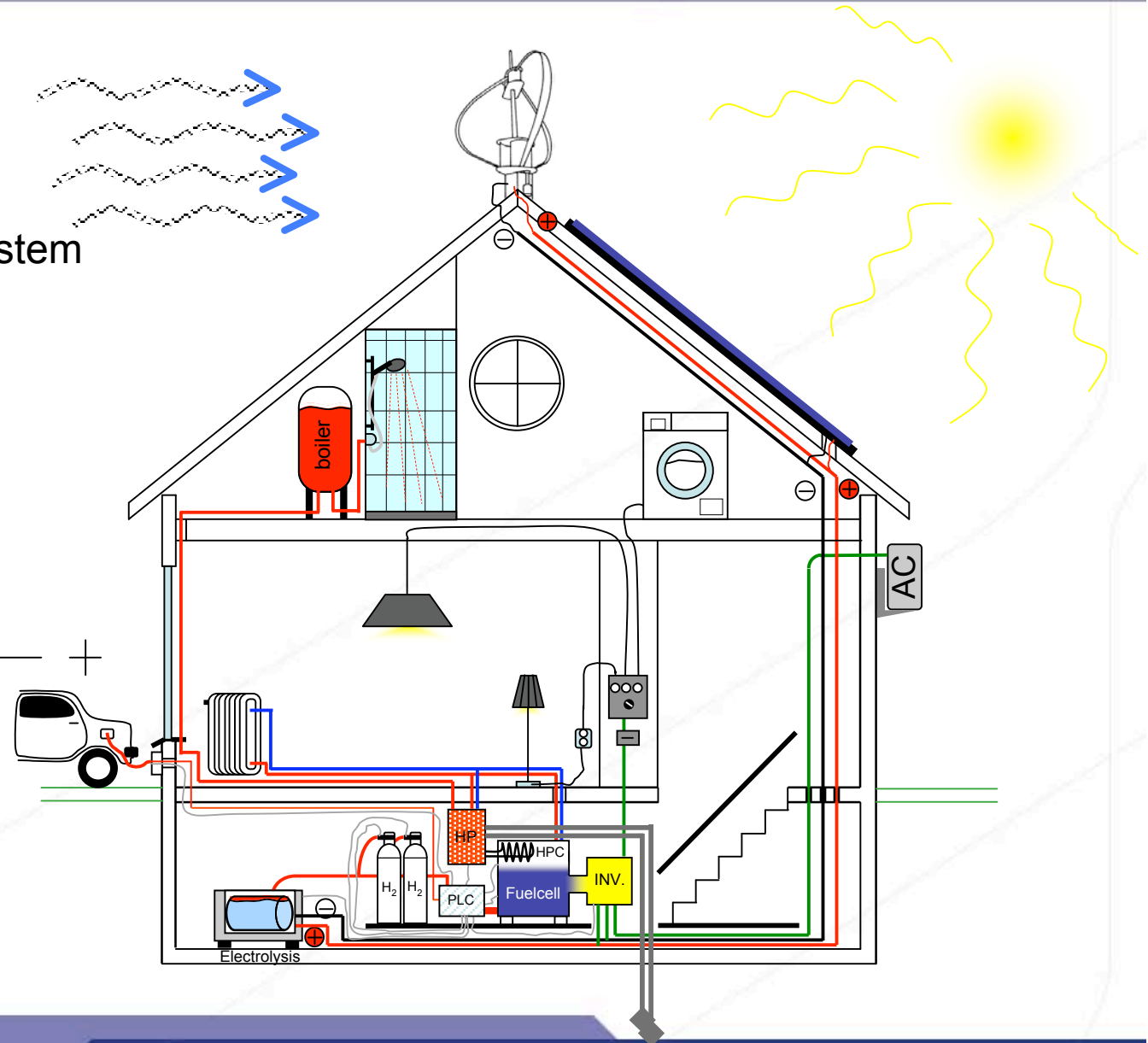
- Fossil fuels limited and taxed very heavily
- Sun and wind unlimited and for free
- Solution in that area available
- Technology proven, but not optimized, nor integrated
- Absolute carbon free solution
- Turn around efficiency of grid 20% energy house 75 %.
- Price comparison PV / Grid is unfair.
- Energy consuming versus energy investing
- Unsentitive for oil market situation

- Research, development, building, testing
- No 1 supplier of de-centralized and integrated solutions for the generation, storage and supply of home-energy
- 100% based on renewable energy (solar/wind)
- CO2 free



- ✓ House
- ✓ Sun / wind
- ✓ Renewable energy system
- ✓ Electrolyser
- ✓ H₂ storage
- ✓ Fuel cell / HPC / HP
- ✓ Inverter
- ✓ Control unit

Total system





The bumpy road to realize innovations

- Concept is proposed
- Disbelieve by market and production engineers
- Proof of principle is built
- System is proven
- Not invented here !
- Can never work ,too simple
- Management is put under pressure by their staff
- Management often in doubt and afraid to pull through.

- Unions are against
- Internal report to underline company threats, in case of implementation of new technology
- In case OEM-product market leaders will suggest failure or total ignorance
- Put in production to show capability
- Market introduction/confrontation

- Focus on strength
- Be sure about business opportunity
- Make milestone decision planning for go or stop
- Keep in mind “windows of opportunity”
- Be not afraid for failure
- Make step by step progress planning
- Follow your hart
- Make RoI calculation

- Only start a new business if you are sure about technical achievability
- Be sure this is your core business , or “could become”

- Make a reverse calculation, based on finished product end price and ROI
- Never calculate on cost price / net gross margin
- Total investment should not exceed 30% of total estimated and cost of development and market-introduction of 3 to 5 years

- Make every month (or day) a milestone decision, to go or stop , based on your starting business plan
- Do not be afraid to stop , if your targets cannot be achieved
- Do not rely on magic before 03.00 a.m.
- Under pressure everything gets liquid
- Under war conditions the best solutions are found

- During the process market situation can change dramatically
- Assumptions made, could be wrong
- Upfront investment up to cash positive situation, should not exceed more than 30% of total expected earnings or not longer than 50% of product life time cycle

- Everybody knows inside whether he is still winning or loosing
- Make a status quo sheet and keep it updated so you can make up your mind
- You are all alone in this
- Be a “fore checker” and not a”back checker”
- Do not try to escape from difficult decisions

- Every new product has a life time cycle
- Be sure you are still within this cycle
- If not : stop in time
- Do not get a prisoner of your venture capitalist or be afraid for loss of face

customers





Success is emotion but no guarantee for the future

THANK YOU

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