



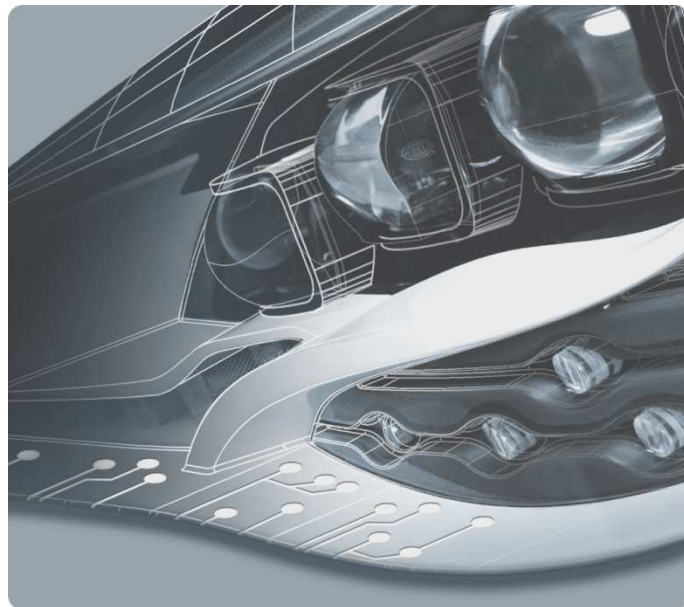
HSS-D Design department

V45-subs

Status Jul-2015

T. Jurejevčič

Hella Saturnus Slovenija d.o.o.



Company History



- 1921 Company's foundation – production of metal sheet boxes
- 1948 Start-up of production of lighting equipment.
- 1965 First export to Volkswagen
- 1971/74 First business contact between Hella and Saturnus for VW Golf I & Beetle.
- 1997 Completed re-privatisation procedure. Hella KGaA Hueck &Co, Lippstadt became the majority owner of the Company - 52%.

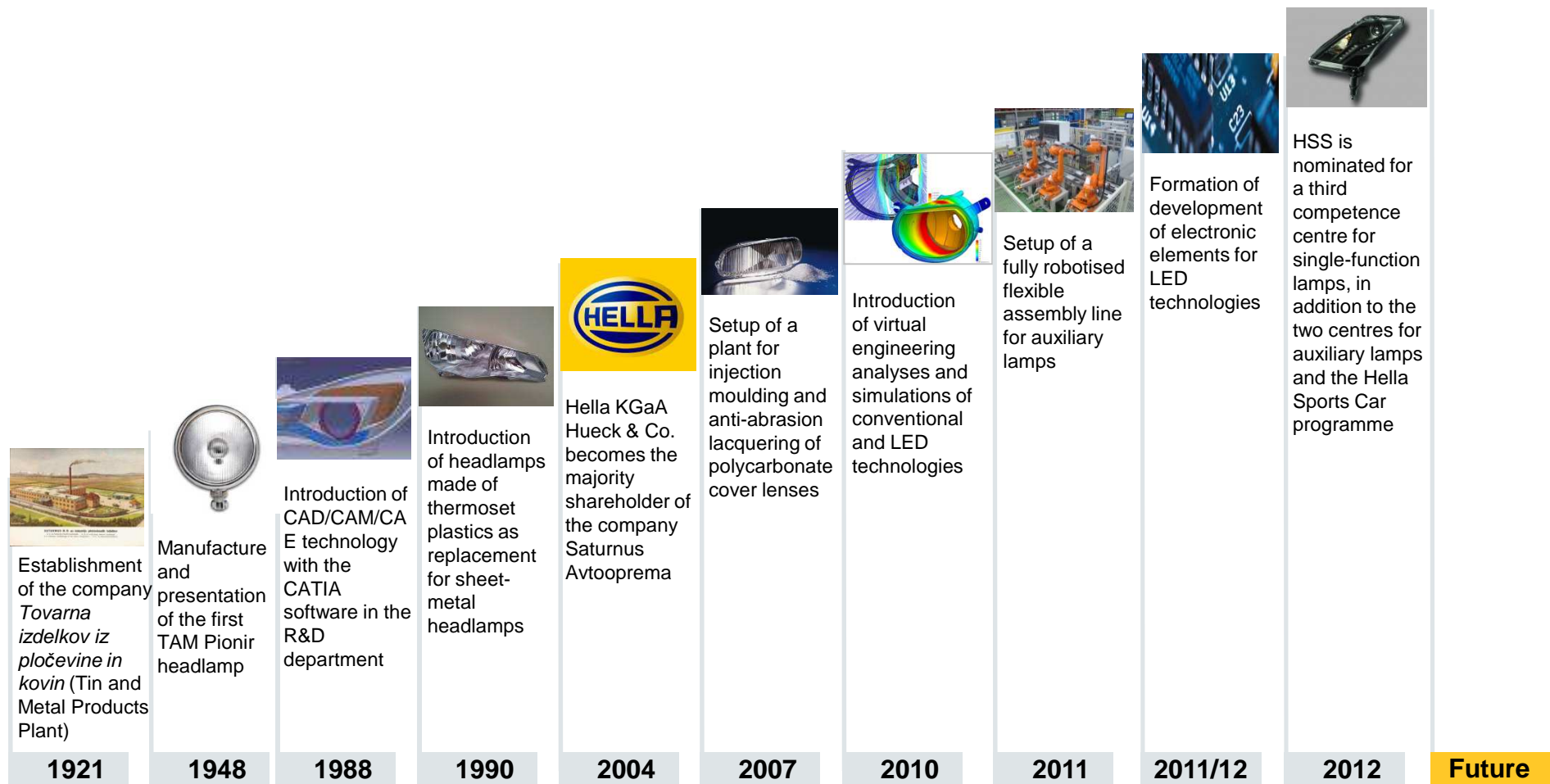


- 2004 Hella KGaA became 100% owner of Saturnus Avtooprema d.d. Saturnus changed the company's legal status and name to Hella Lux Slovenija d.o.o.
- 2008 The company name was changed from Hella Lux Slovenija d.o.o. to Hella Saturnus Slovenija d.o.o.
- 2011 90 th Anniversary of SATURNUS “A period of Progress and Success ”



Hella Saturnus Slovenija

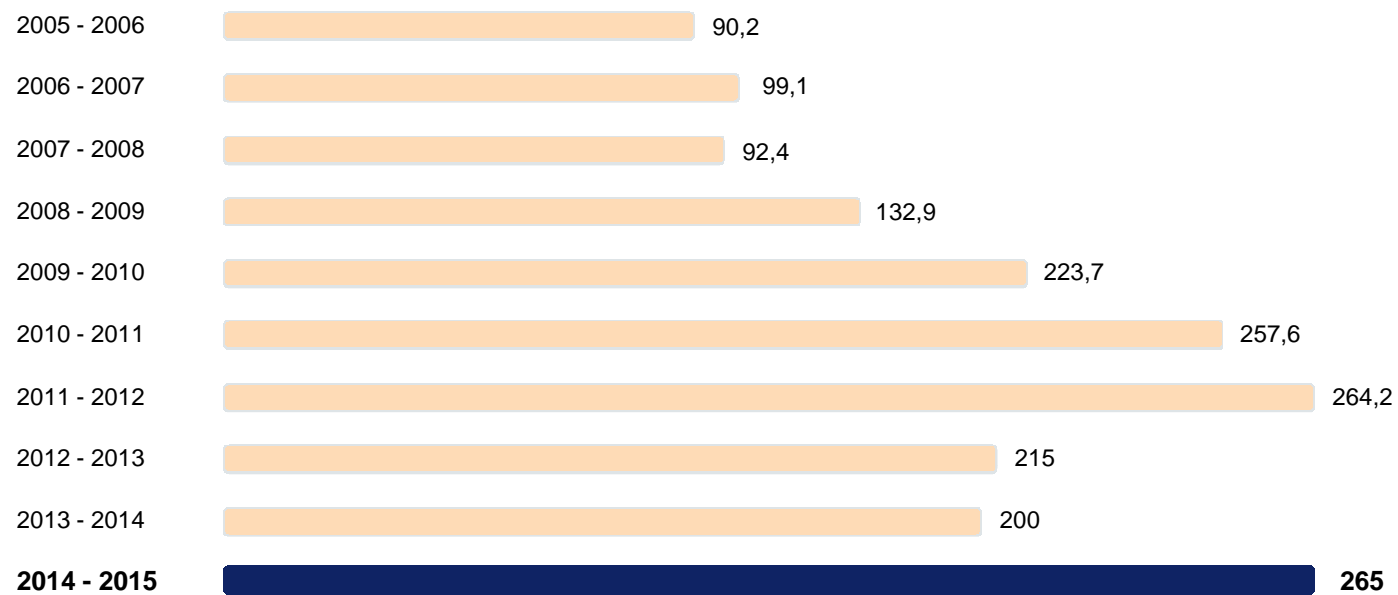
Milestones



Hella Saturnus Slovenija

Sales

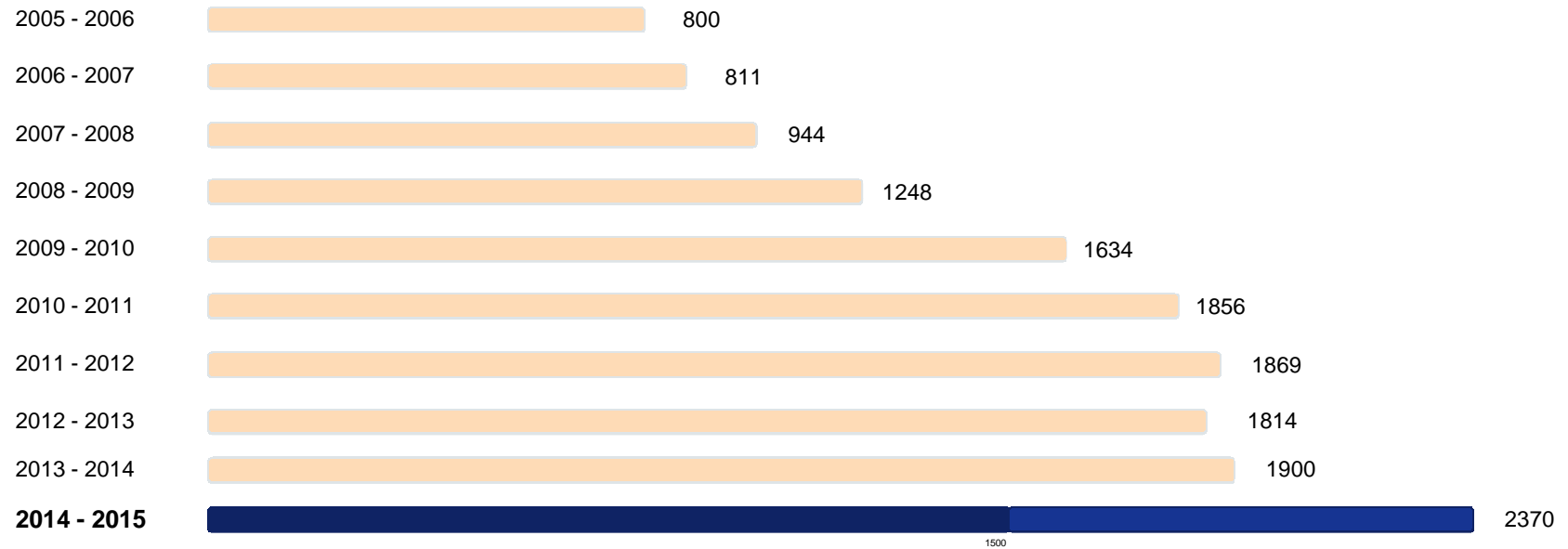
Sales (mio €)



Hella Saturnus Slovenija

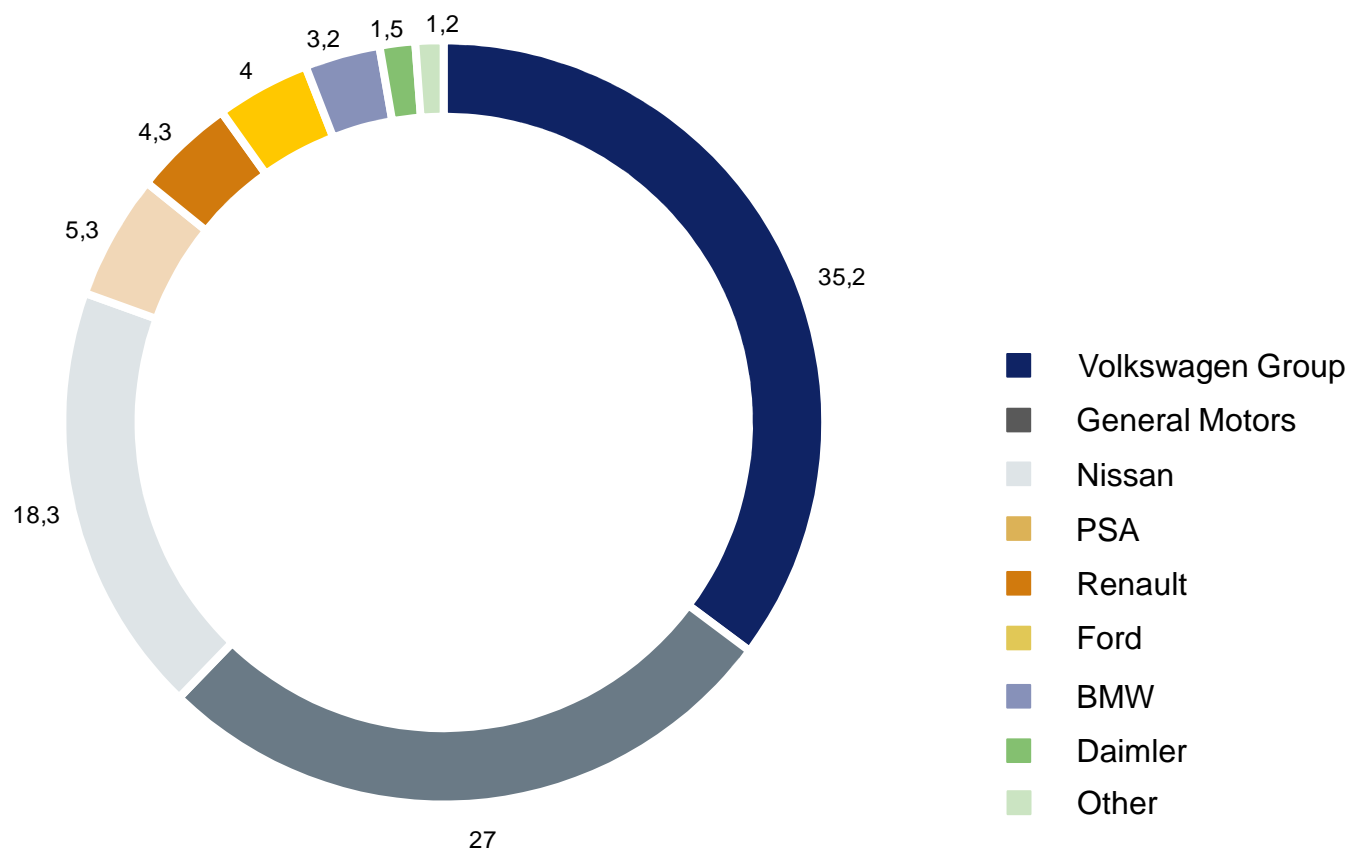
Employees

(May 31, each)



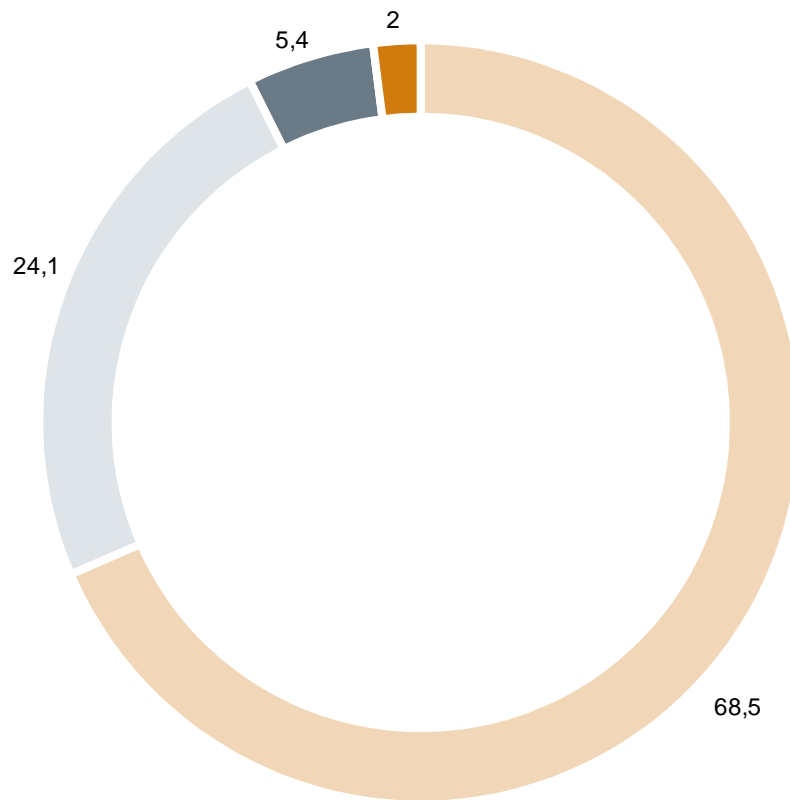
Hella Saturnus Slovenija

Market coverage by Customers (in %)



Hella Saturnus Slovenija

Production programme share (in %)

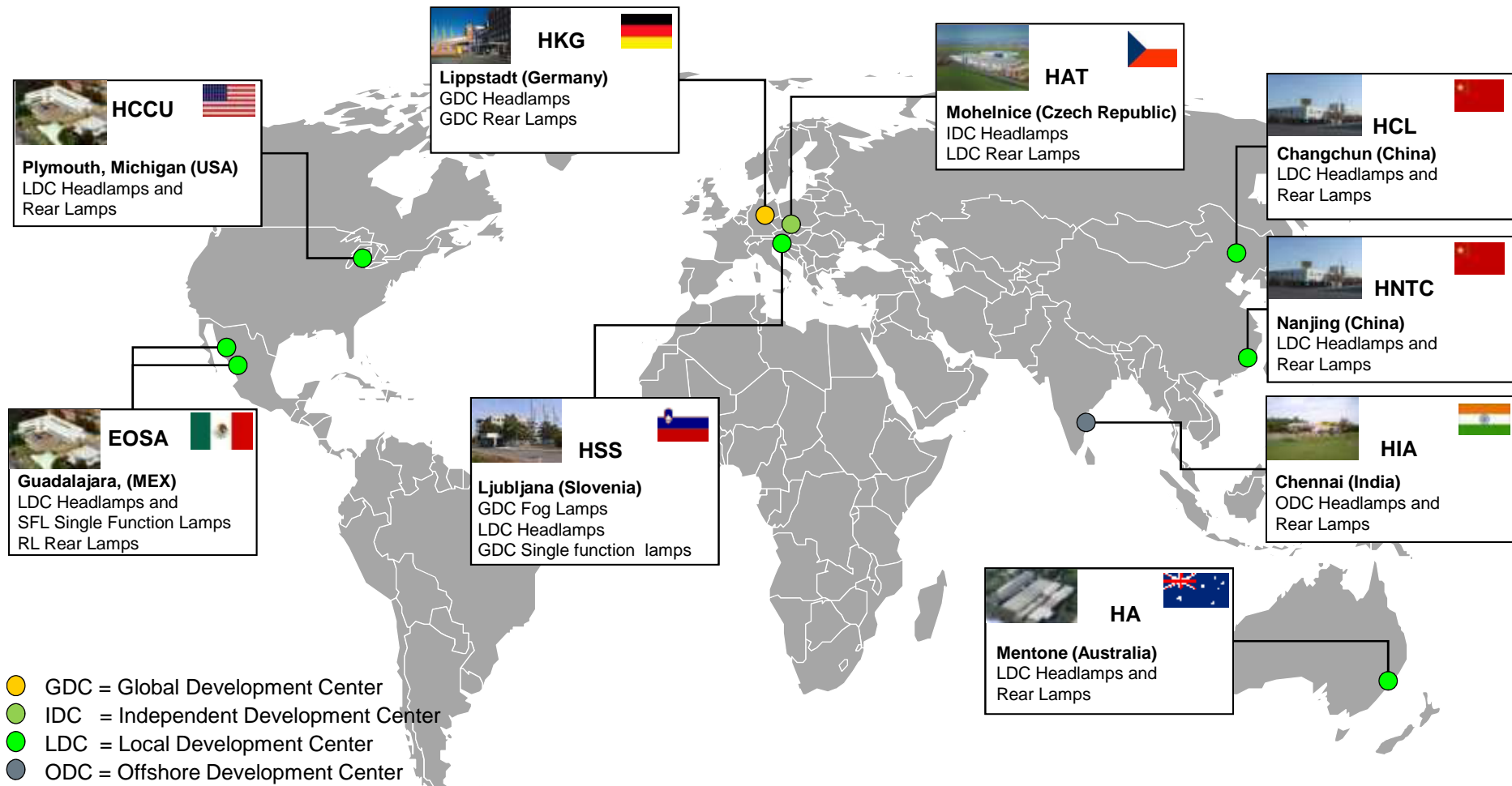


Pcs in thousands

Fog lamps	8,400
Headlamps	2,500
SFL	300
Industries	60

Hella Group

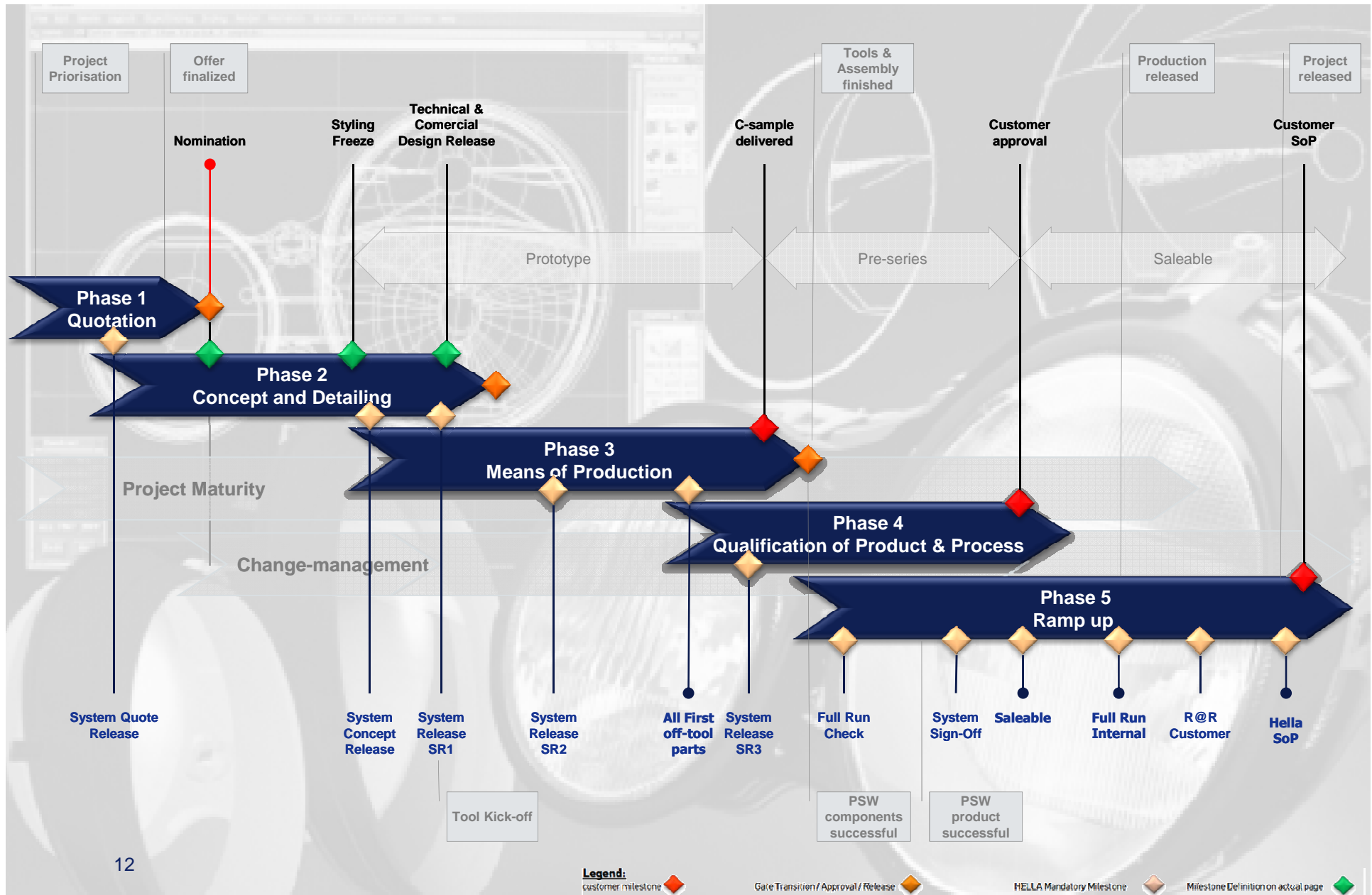
Development Footprint



Hella Saturnus Slovenija - Design & Development

System Development

ISO-TS 16949



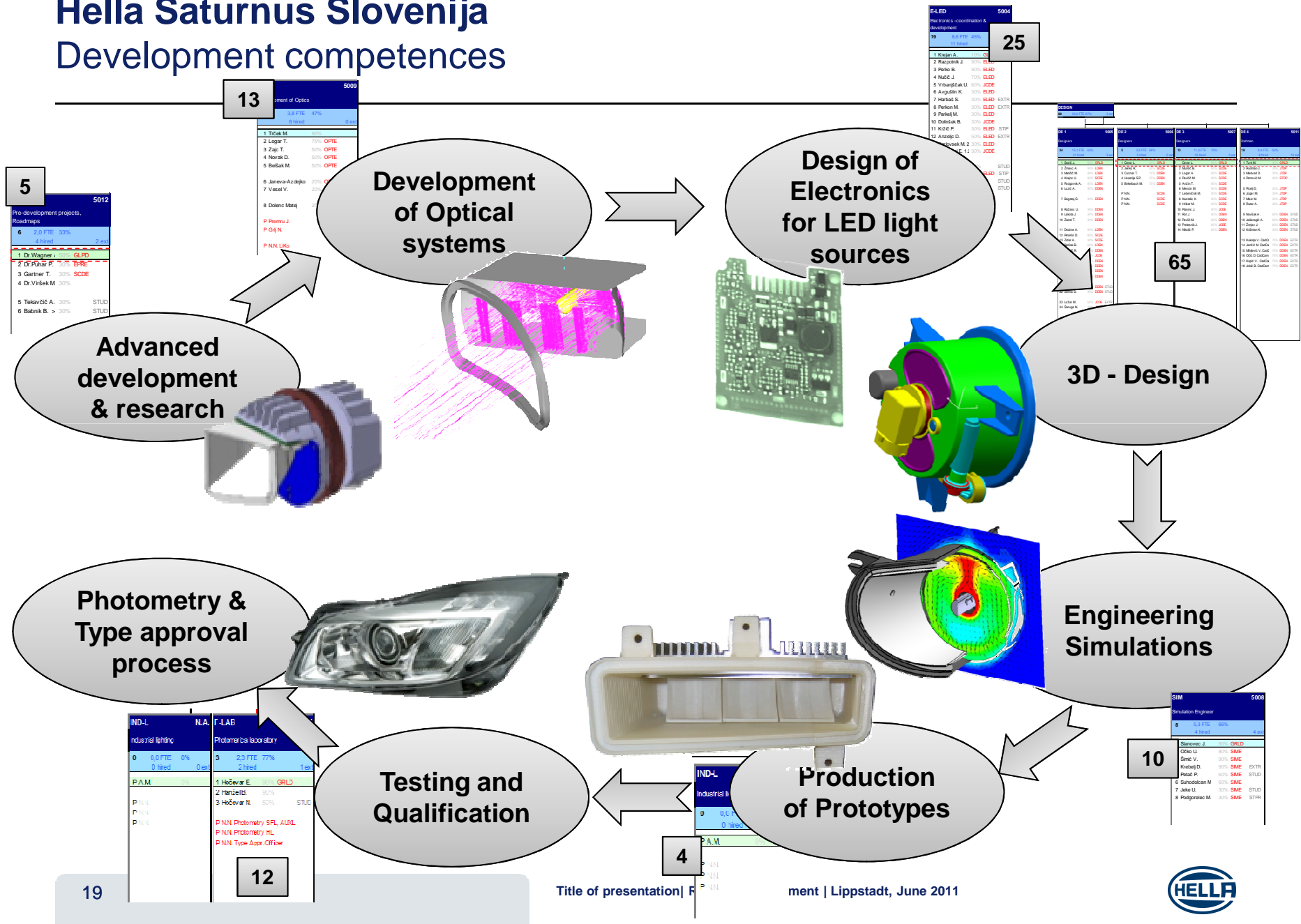
Hella Saturnus Slovenija

Competences



Hella Saturnus Slovenija

Development competences



Development groups DE-1,-2,-3,-4

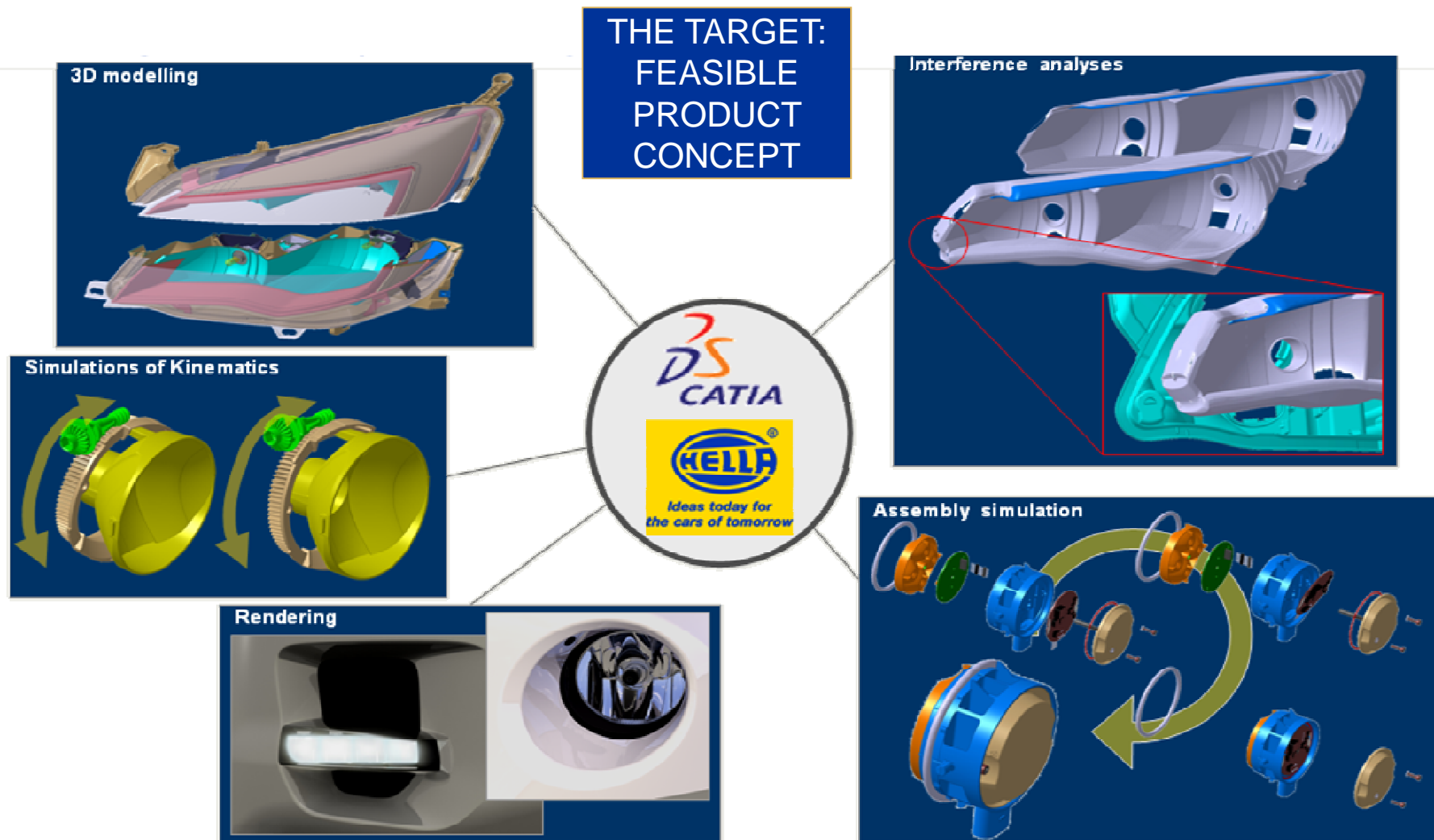
Developers



DESIGN		5005		5006		5007		5014		
87		36,2 FTE 76%		47 ext						
DE 4 (DP7)	5005	DE 2 (DP8)	5006	DE 3 (DP9)	5007	DE 4 (DP12)	5014			
Designers		Designers		Designers		Draftmen				
26	19,9 FTE 77%	0	6	4,1 FTE 51%	0	13	12,2 FTE 87%	0	22	
	0 hired	26 ext		-2 hired	8 ext		0 hired	13 ext		
1 Sostiö J.	HSS		1 Cerar L.	30% GRLE	HSS		Cerar L.	30% GRLE	HSS	
2 Žrnavo A.	HSS		2 Jenko R.	HSS		2 Muršič B.	HSS		2 Rudman J.	HSS
3 Matičič M.	HSS		3 Cuznar T.	HSS		3 Logar A.	HSS		3 Medved D.	HSS
4 Krajnc U.	HSS		4 Hvastija S. P.	EXTR		4 Pavličič M.	HSS		4 Petrovič M.	HSS
5 Podgornik A.	HSS		5 Birkelbach M.	HSS		5 Anžin T.	HSS		5 Plečelj D.	HSS
6 Ložič A.	HSS		6 Joger M.	HSS		6 Mencin M.	HSS		6 Msić M.	HSS
7 Bogataj G.	HSS					7 Leberičnik M.	HSS		7 Rutar A.	HSS
8 Rožanc U.	EXTR		P Muthu (HEI)	EXTR		8 Kastelic K.	HSS		8 Avguštin T.	HSS
9 Lakota J.	HSS		P Saravanan (HEI)	EXTR		9 Hribar M.	HSS		9 Zvonar B.	HSS
10 Zadel T.	HSS					10 Planinc J.	HSS		10 Križman K.	STUD
11 Drobne A.	HSS					11 Rot J.	HSS		11 Senica Klavdija	STUD
12 Peterlin D.	HSS		P N.N.			12 Pavličič M.	HSS		12 Šrnjanič Jure	STUD
13 Zidar A.	HSS		P N.N.			13 Prelesnik J.	HSS		13 Žnidnič T.	EXTR
14 Belšak B.	HSS					14 Nikolič P.	HSS			
15 Mihalič R.	HSS									
16 Jereb G.	HSS								14 Kukulija V. CadC	EXTR
17 Vu Guerero F.	HSS								15 Jančič M. CadC	EXTR
18 Tehovnik M.	HSS								16 Mhljevič V. Cad	EXTR
19 Maleševič M.	HSS								17 Očič D. CadCar	EXTR
20 Galijot Sandi	HSS								18 Kopic V. CadCa	EXTR
21 Purgar T.	EXTR								19 Jokič B. CadCa	EXTR
22 Šimnic D.	EXTR								20 Bingula S. CadC	EXTR
23 Ložar M.	EXTR								21 Krvdlo I. CadCa	EXTR
24 Šaruga N.	HSS									
25 Glavač A.	EXTR									
26 Jasaragić A.	HSS								22 Žerjav J.	STUD

Hella Saturnus Slovenija - Design & Development

Design & Development using Catia V5



Optical engineering group

Design of Optics

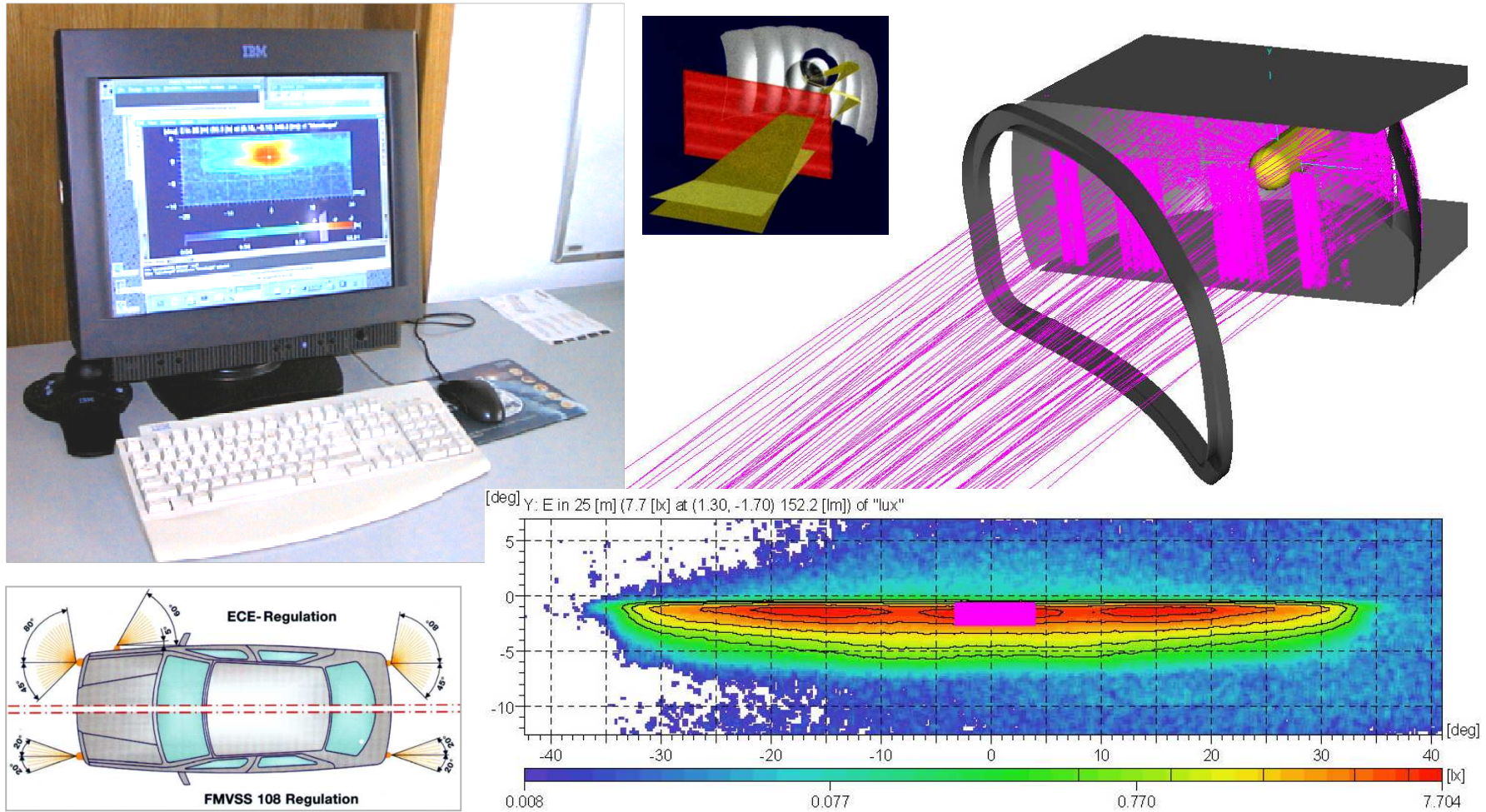
LE		5009	
Development of Optics			
8	3,8 FTE	47%	
	8 hired		0 ext
1 Trček M.		90%	
2 Logar T.		75%	OPTE
3 Zajc T.		50%	OPTE
4 Novak D.		50%	OPTE
5 Bešak M.		50%	OPTE
6 Janeva-Azdejko		20%	OPTE
7 Vesel V.		20%	OPTE
8 Dolenc Matej		20%	OPTE
P Premru J.			OPTE
P Grif N.			OPTE
P N.N. Likó			



Hella Saturnus Slovenija - Design & Development

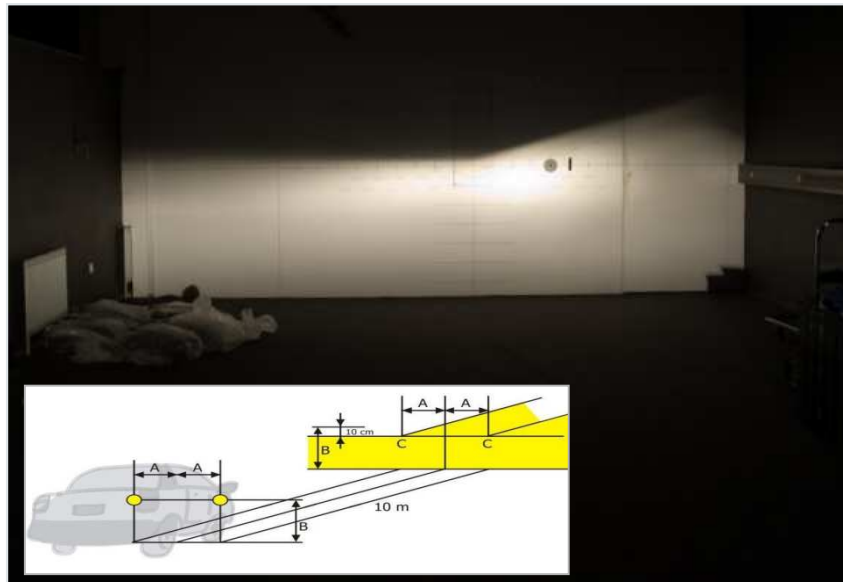
Development of Optics

Design & Analysis of photometrical surfaces– ECE, SAE



Hella Saturnus Slovenija - Design & Development Photometrical Laboratory

- Photometrical measurements and tests for
 - support of Design
 - support of Production
 - support of Quality Claims
- Photometrical measurements and sampling for applications for Type approval
- Management of calibration and maintenance of Photometers & equipment
- Members of GTB Working group Photometry (Slovenian representative)



Laboratorij za fotometrijo Hella Lux Slovenija d.o.o.
PHOTOMETRIC RESULTS

Program	RASTLX H65 V1505G		
RASTER Lx: H65 V1505G STEP 0.50°	S.50		
Name	TOYOTA COROLLA RH PES REFL T528 RAST		
Number	Design		
Support	M11		
Test no.	1		
Lamp type	HB4 ET PH EL04-T54		
Lamp no.	EL04-T54		
Lamp flux	820 lm	Operator	Edvin Hovsevar
Voltage	12.045 V	Date	14.07.05 10:11:38
Current	4.163 A	File	TOYOTA COROLLA RH PES REFL T528 RAST
Comment	S plasticnim standard HB4 reflektorom.		

Road diagram TOYOTA COROLLA RH PES REFL T528 RAST / RASTER H65 V-15°/45°Step.5°

The road diagram shows a graph of light intensity distribution. The vertical axis is labeled 'lx' and ranges from -20 to 20. The horizontal axis is labeled 'lx' and ranges from 5 to 50. The graph displays several colored curves representing different light beam paths. The curves are labeled with values: 1, 2, 4, 16, 64, 96, 128 lx. The curves show a peak intensity of approximately 128 lx at a distance of about 15 lx. The graph is titled 'Rastljava na cestnici 0.50°'.

Program	RASTLX H65 V1505G STEP 0.50°	Lamp type	HB4 ET PH EL04-T54	Revision	06/02 to
Name	TOYOTA COROLLA RH PES REFL T528 RAST	Lamp no.	EL04-T54	Unit	lx
Number	Design	Lamp flux	820 lm	A. No.	A. No.
Support	M11	Voltage	12.045 V	Operator	Edvin Hovsevar
Test no.	1	Current	4.163 A	Date	14.07.05 10:11:38
Comment	S plasticnim standard HB4 reflektorom.				

1000 Ljubljana, Letaška c. 17a Slovenija
E-mail: h5.hovsevar@hella.com

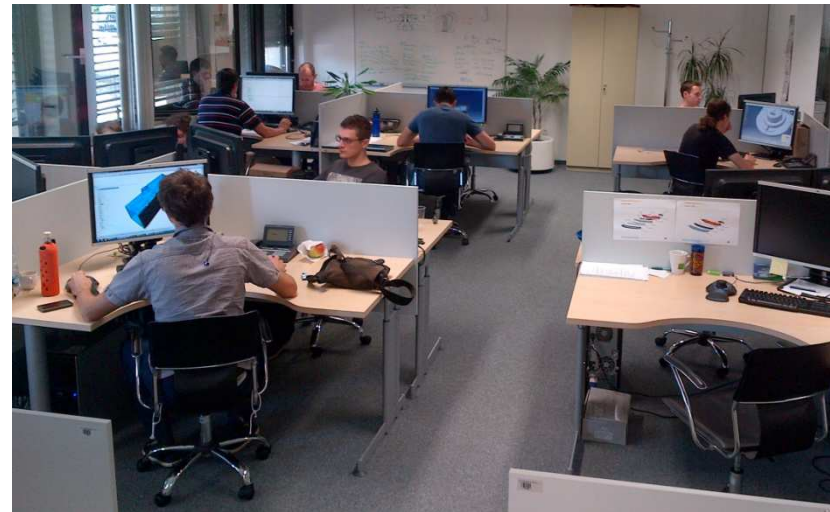
Tel (+386) 1 5233 334
Fax (+386) 1 5233 405



Simulation engineering group

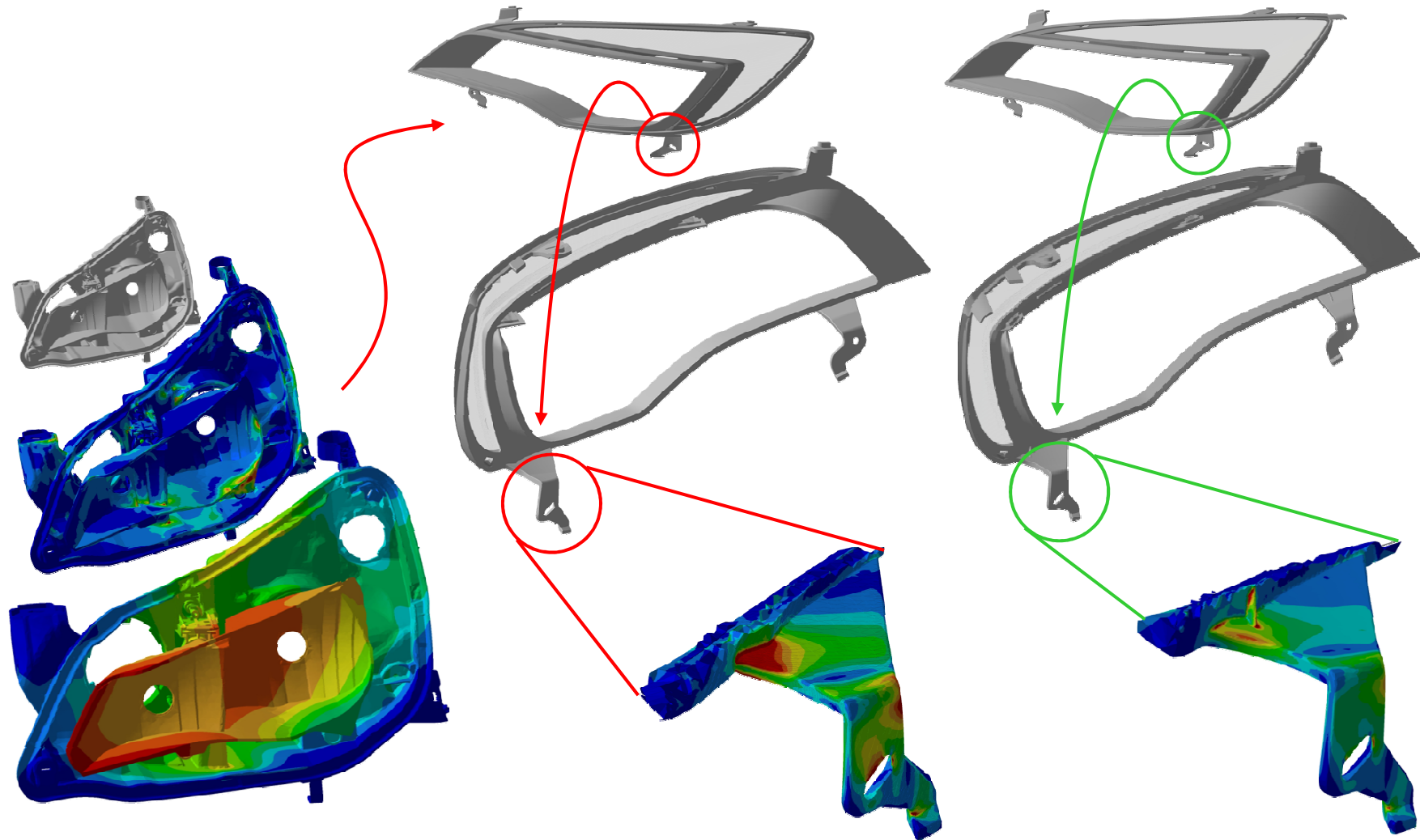
Engineering Simulations

SIM		5008	
Simulation Engineer			
8	5,3 FTE	66%	
	4 hired		4 ext
1	Slanovec J.	90%	GRLD
2	Očko U.	80%	SIME
3	Šimić V.	90%	SIME
4	Krebelj D.	90%	SIME EXTR
5	Petač P.	60%	SIME STUD
6	Suhodolčan M	60%	SIME
7	Jeke U.	30%	SIME STUD
8	Podgorelec M.	30%	SIME STPR



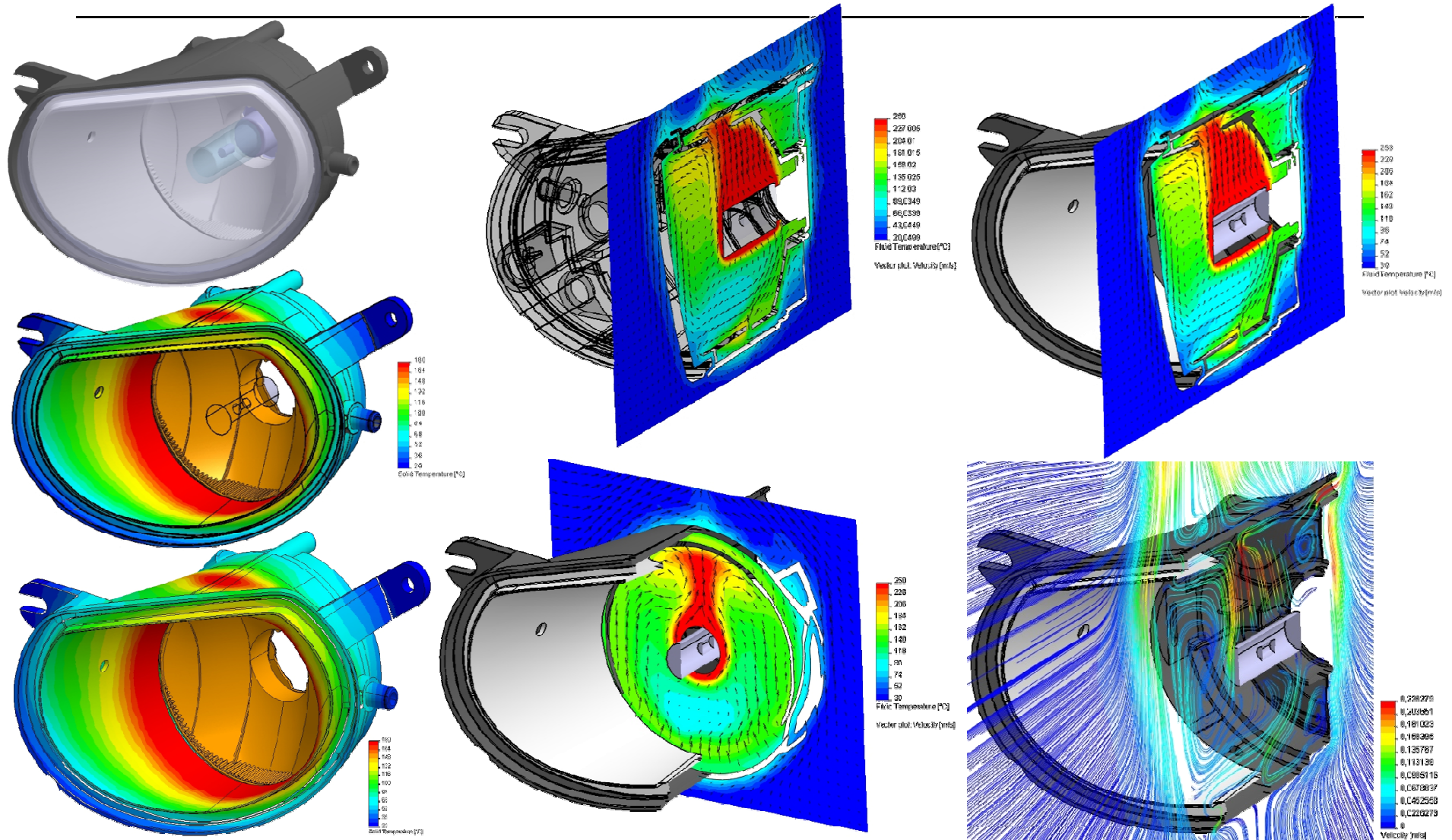
Hella Saturnus Slovenija - Design & Development

FEM Structural analyses - Stress-strain optimisations



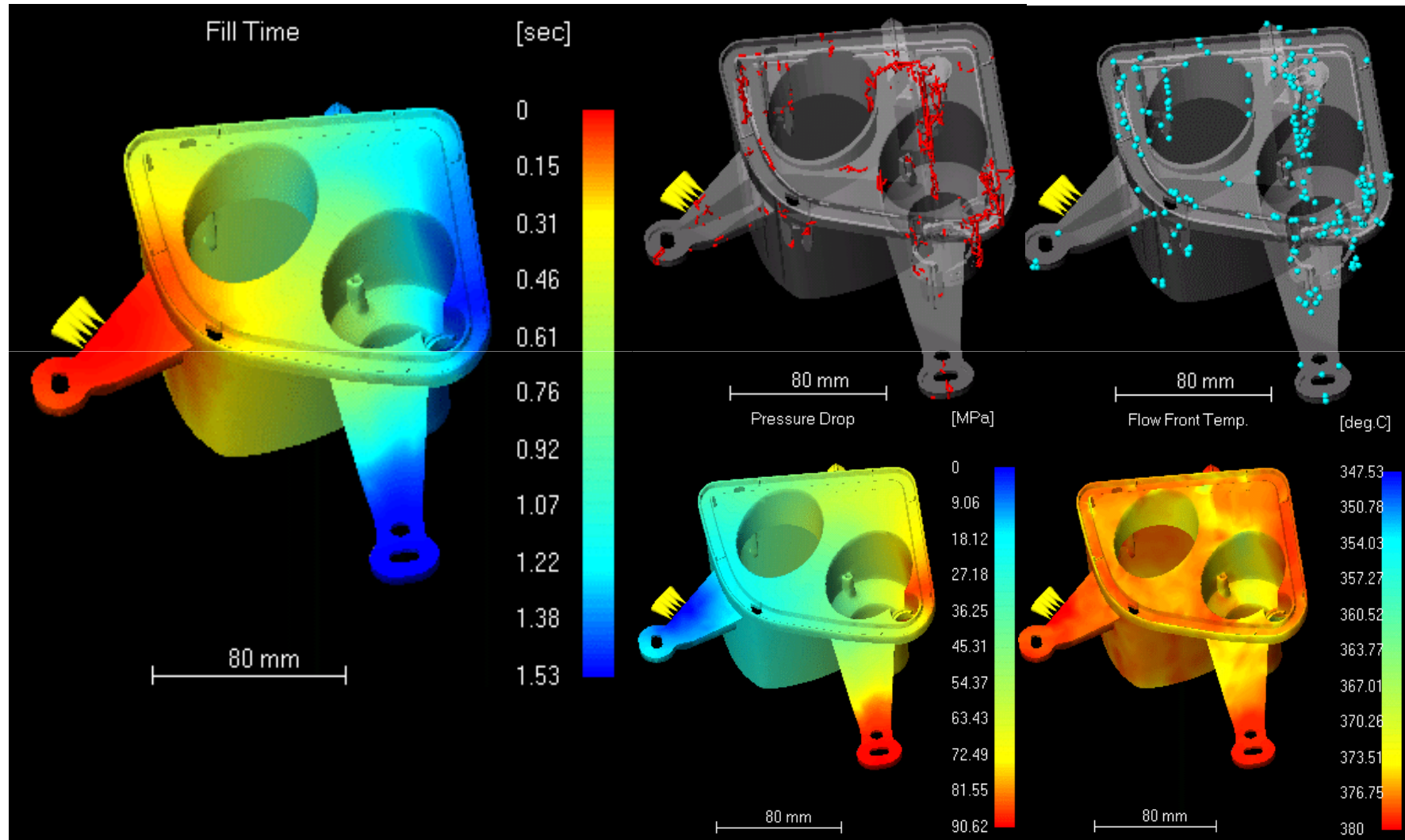
Hella Saturnus Slovenija - Design & Development

CFD analyses - Thermomanagement



Hella Saturnus Slovenija - Design & Development

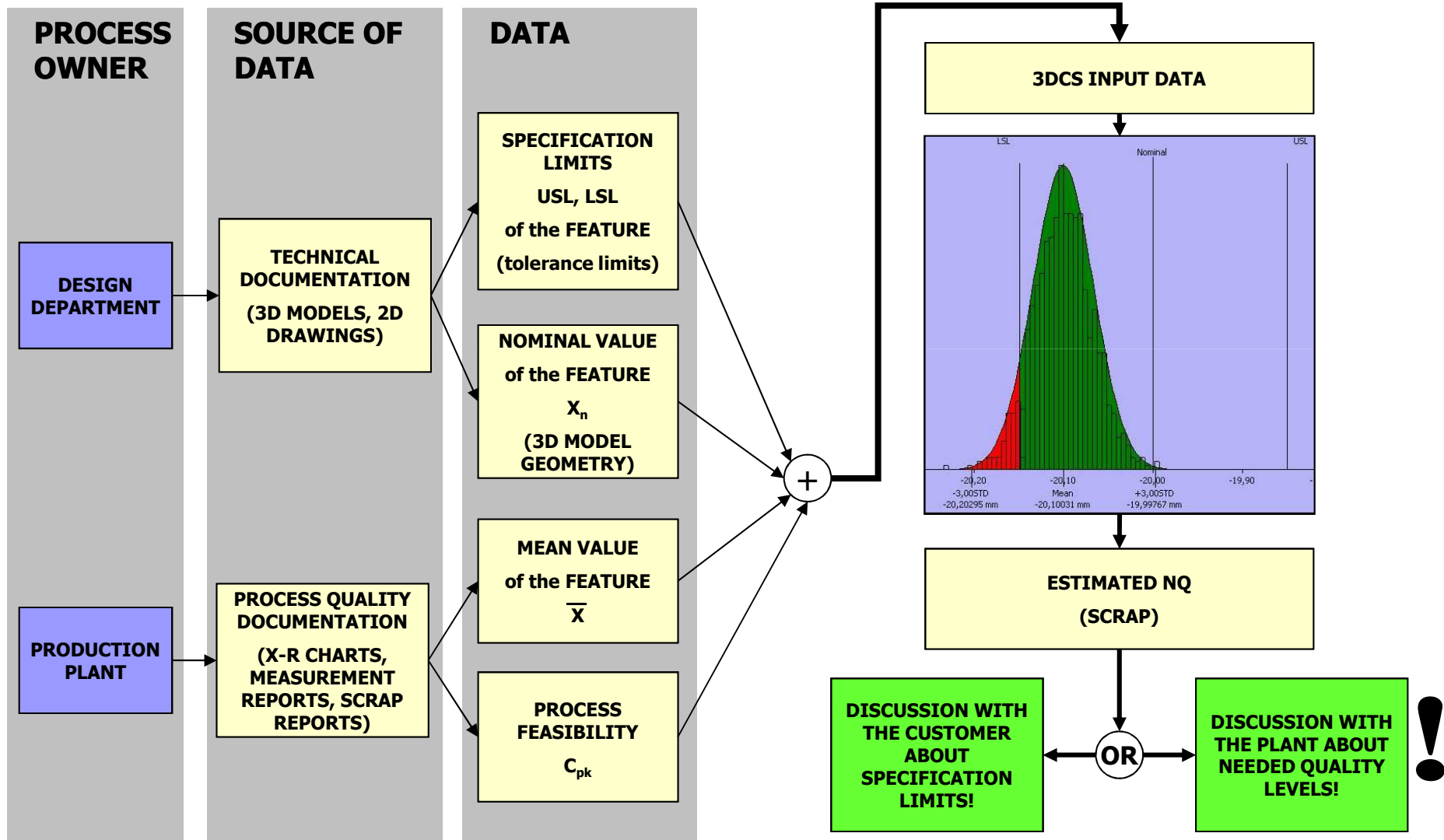
Injection molding simulations & analyses



Hella Saturnus Slovenija – D&D

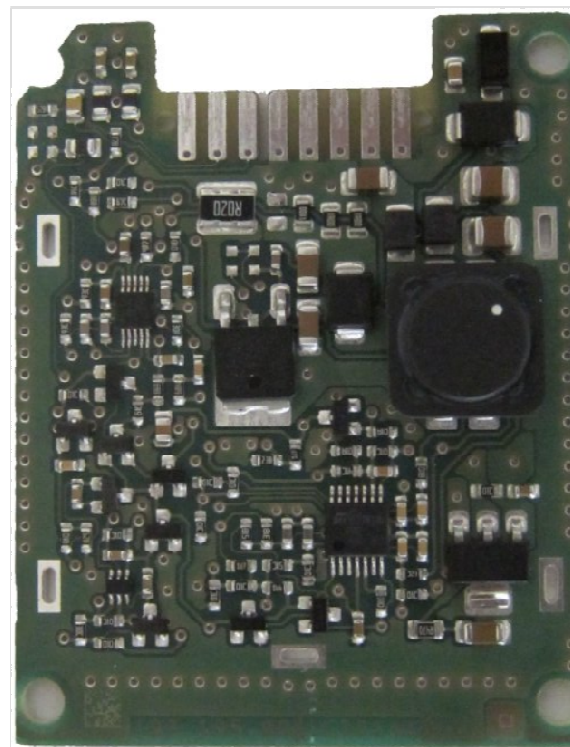
Tolerance simulations

$$C_{pk} = \text{Min} \left\{ \frac{\bar{x} - \text{LSL}}{3s}; \frac{\text{USL} - \bar{x}}{3s} \right\}$$



LED electronics
engineering group

Design of Electronics




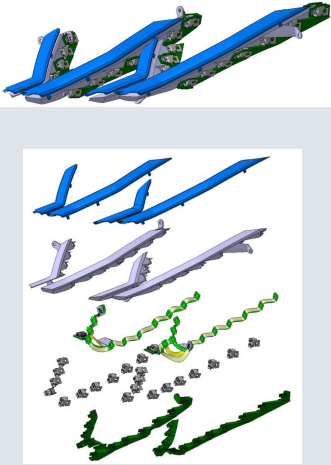


E-LED		5004
Electronics -coordination & development		
19	8,0 FTE 45%	
	11 hired	8 ext
1	Krejan A.	10% GLED
2	Razpotnik J.	90% ELED
3	Perko B.	90% ELED
4	Nučič J.	70% ELED
5	Vrbanjšček U.	60% JCDE
6	Avguštin K.	30% ELED
7	Harbaš S.	30% ELED EXTR
8	Perkon M.	30% ELED EXTR
9	Parkelj M.	30% ELED
10	Dolinšek B.	30% JCDE
11	Kržič P.	30% ELED STIP
12	Anzeljc D.	50% ELED EXTR
13	Karlovsek M. z	30% ELED
14	Kostomaj E. 1.	30% JCDE
15	Slivnik Mojca	50% STUD
16	Kobe Aleš	50% ELED STIP
17	Kurinčič Andre	50% STUD
18	Mušič Admir	50% STUD
19	Polajnar Ž.	50% JCDE



19	Polajnar Ž.	50% JCDE
18	Mušič Admir	50% STUD
17	Kurinčič Andre	50% STUD
16	Kobe Aleš	50% ELED
15	Slivnik Mojca	50% STUD
14	Kostomaj E. 1.	30% JCDE




What do we develop?

Electronics for Headlamps	Components	Electronics for Auxiliary lamps	Electronics for SF lamps
<ul style="list-style-type: none">- Complex systems- Demanding architecture 	<ul style="list-style-type: none">- Subassemblies for headlamp functions (DRL, DI, PO, CL,...) 	<ul style="list-style-type: none">- Foglamps- Position, direction etc. 	<ul style="list-style-type: none">- CHMSL- Side markers- Licence plate lamps- DI in mirrors 

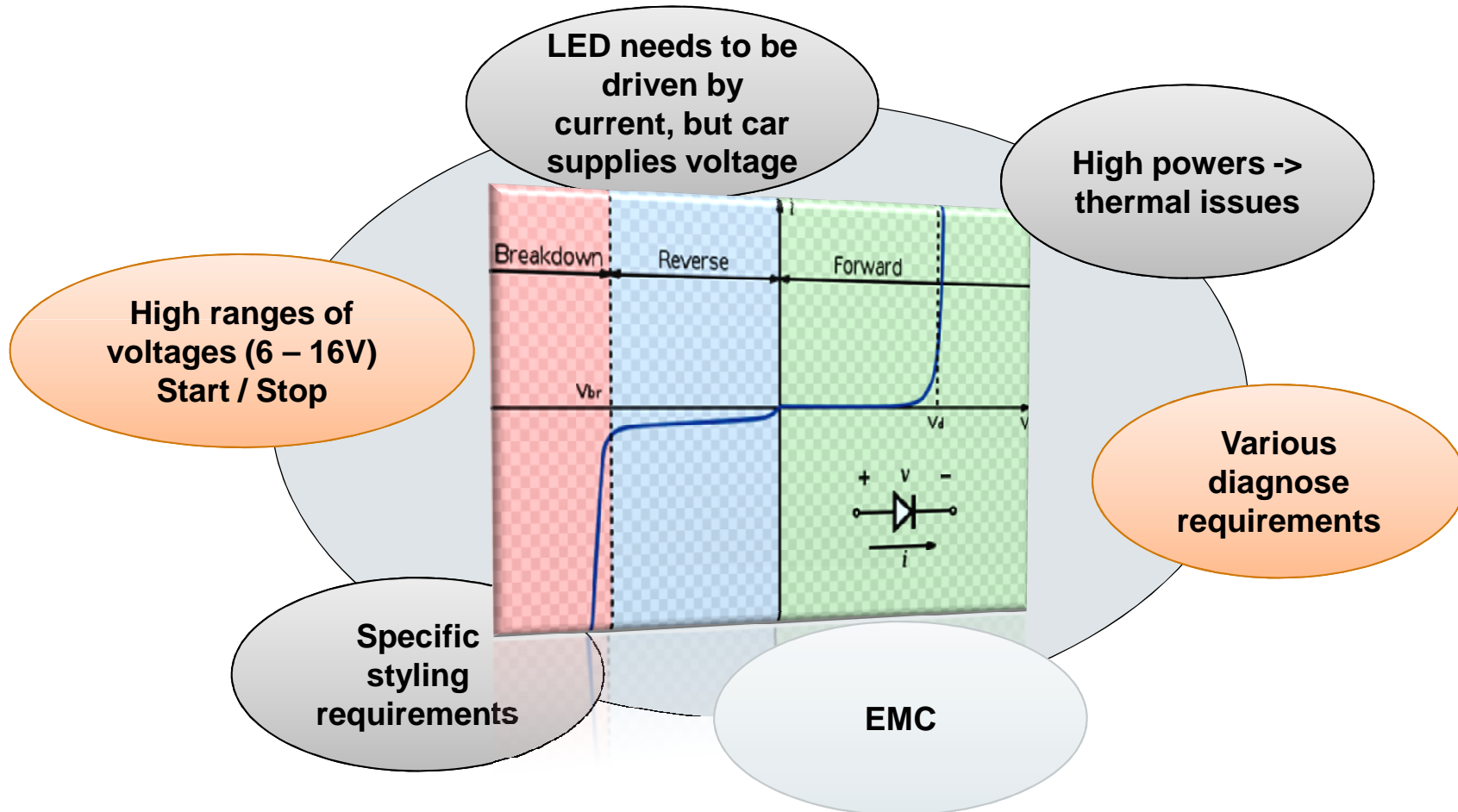
E-LED development

Development process & tools

SW tools	HW tools	Consultations
<ul style="list-style-type: none">- Microcap for simulations- Cadence Allegro for schematics and layout- Cadbas is centralized library of components- Catia for mechanical development	<ul style="list-style-type: none">- Power supplies- Multimeters- Oscilloscopes- EMC equipment 	<ul style="list-style-type: none">- Consultations with experts at HKG- Highly specialized knowledge -> network is very important- Regular reviews

E-LED development

Main development challenges



E-LED development

LED Drivers

Preresistor

Resistor to control current – poor regulation, low efficiency, very cheap.
Very low EMC risk.

CCS

Constant current source – good regulation, low efficiency, cheap.
Low EMC risk.

DC-DC

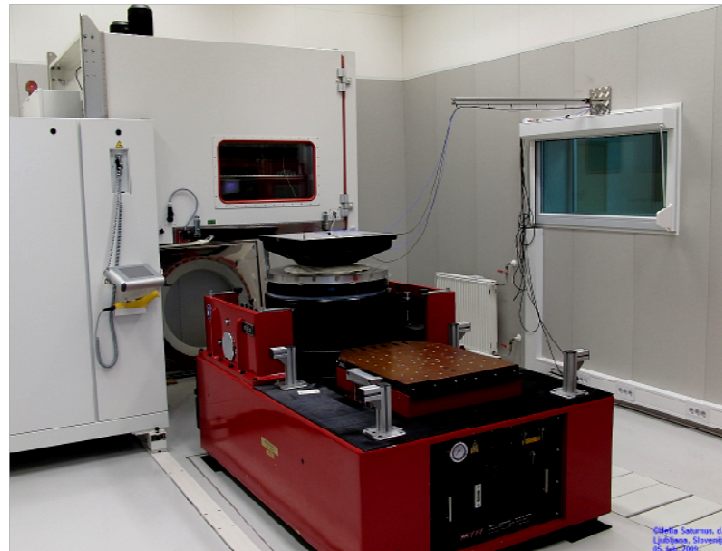
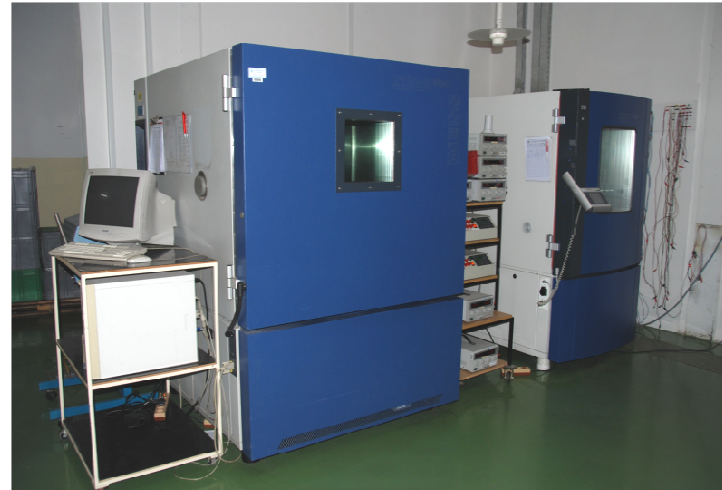
Switching power supply – good regulation, high efficiency, higher price.
High EMC risk.

SMPC

Standard Hella DC DC drivers – no development cost.
Relatively big, not for low supply voltages, not for lower LED count.



Laboratories
Testing



Hella Saturnus Slovenija – D&D, Quality Department

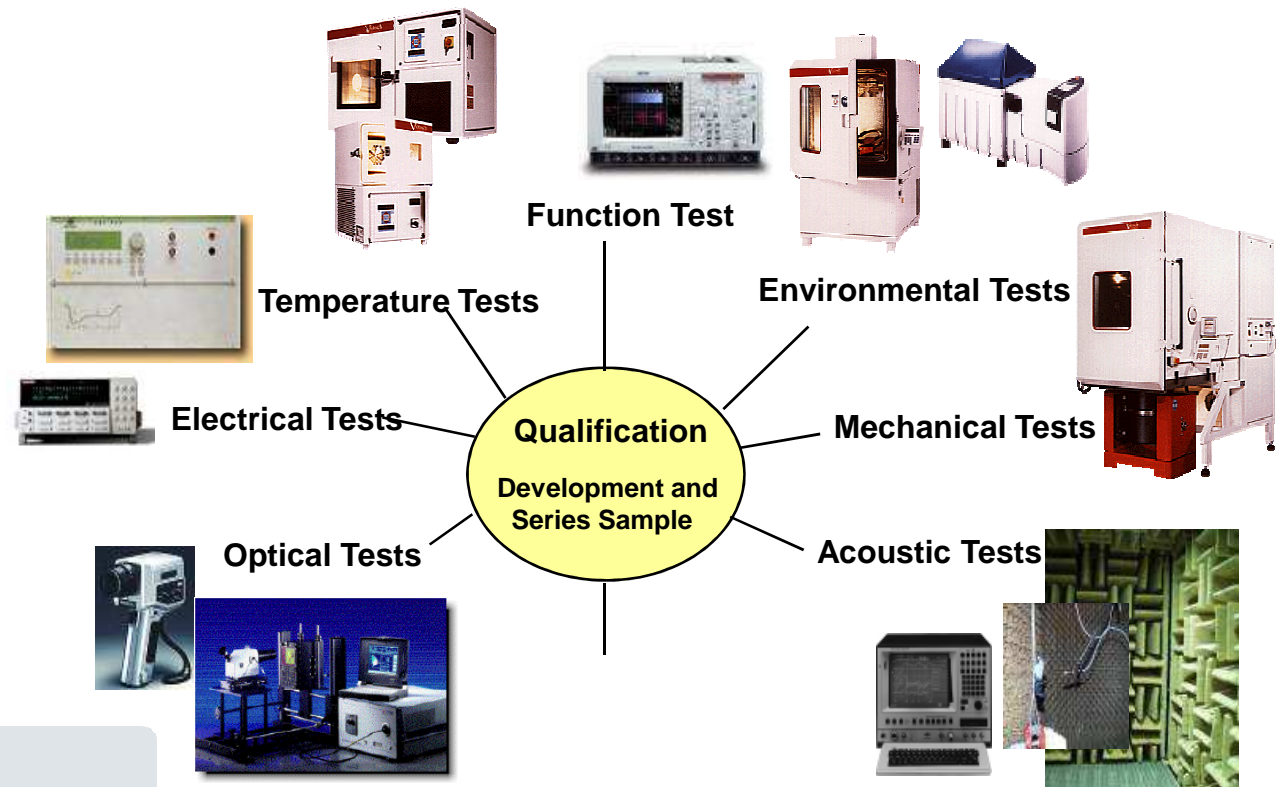
Testing & Qualification Laboratory

→ Tasks

- Measurement & testing for Design & Development
 - Testing of new concepts
 - Qualification testing & measurement
- Measurement & testing for Production process
- Measurement & Testing for Quality management (Claim management)

→ Equipment for

- Temperature tests (high, low temp., humidity)
- Rain chamber tests
- Vibration tests
- Salt spray tests
- Dust tests
- Chemical resistance





PRE-D		5012	
Pre-development projects, Roadmaps			
6	2.0 FTE 33%		
	4 hired		2 ext
1	Dr.Wagner . 50%	GLPD	
2	Dr.Puhar P. 30%	EPRE	
3	Gartner T. 30%	SCDE	
4	Dr.Viršek M 30%		
5	Tekavčič A. 30%		STUD
6	Babnik B. > 30%		STUD

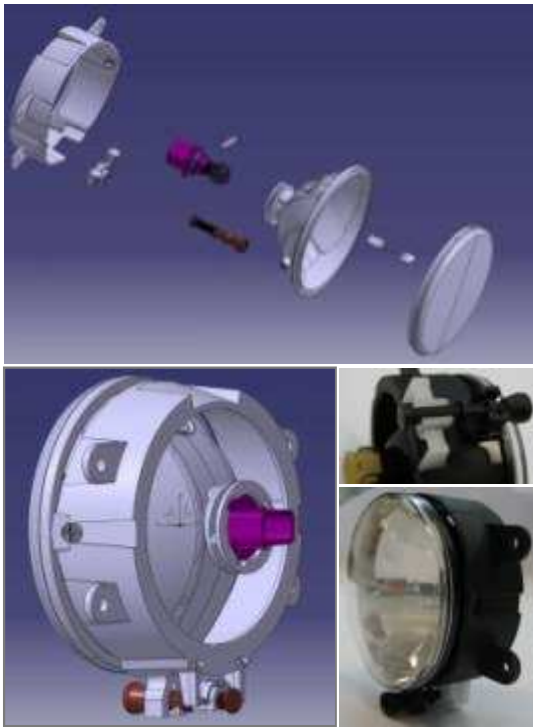
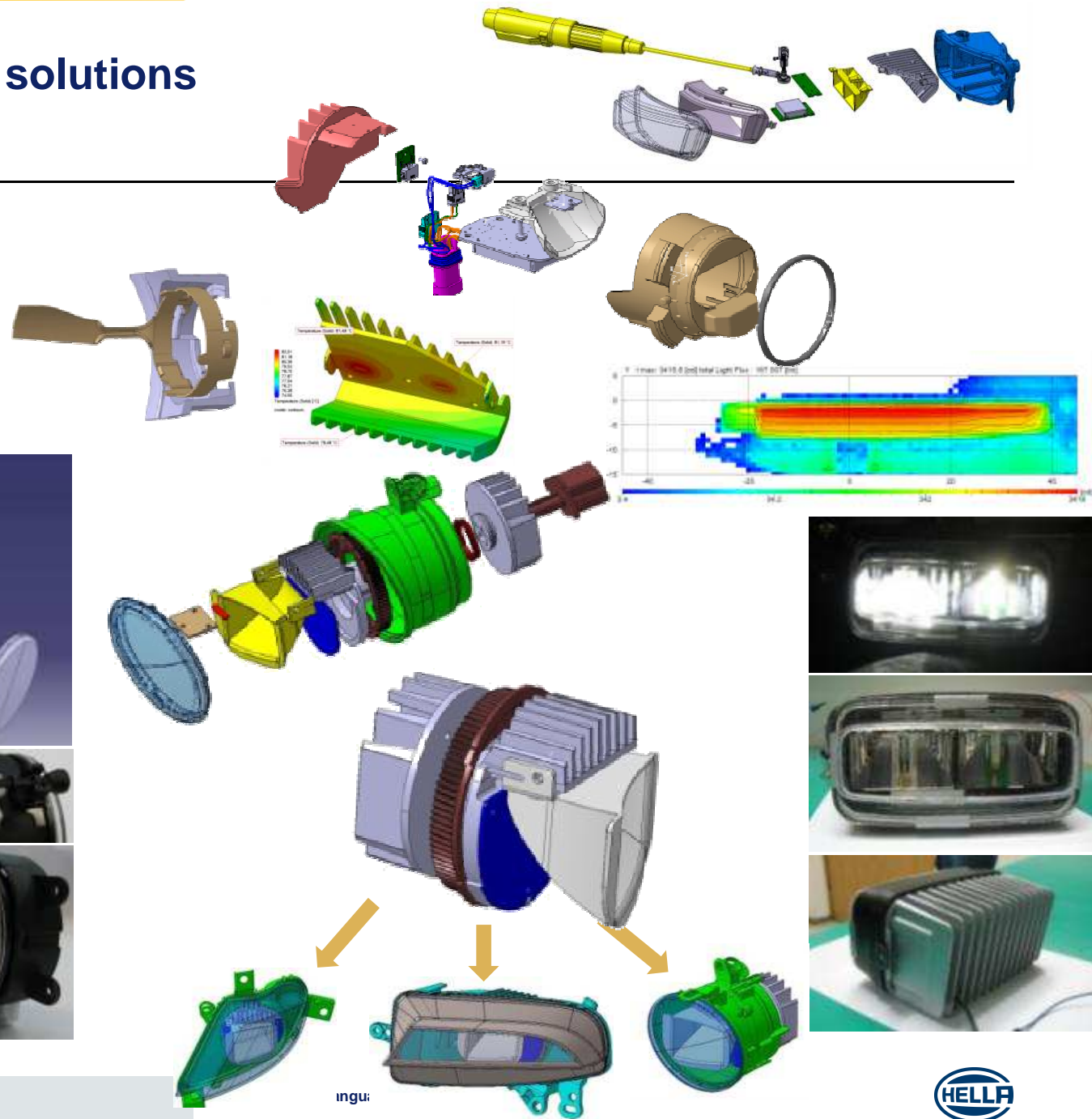
Advanced development group

Pre-Development



Pre-development solutions

- CFL foglamp
- LCC foglamp
- LED F3 foglamp
- Standard bulb shields



Academia

Cooperation with local Universities

Cooperation

→ Faculty of Mechanical Engineering, UNI-LJ – fields of interest:

- FEM analyses
- Trainings of HSS staff
- Student practicum at HSS

→ Faculty of Mechanical Engineering, UNI-MB – fields of interest:

- CFD analyses
- Trainings of HSS staff
- Student practicum at HSS

TRANSLATION:

University of Ljubljana again among 3% best Universities worldwide

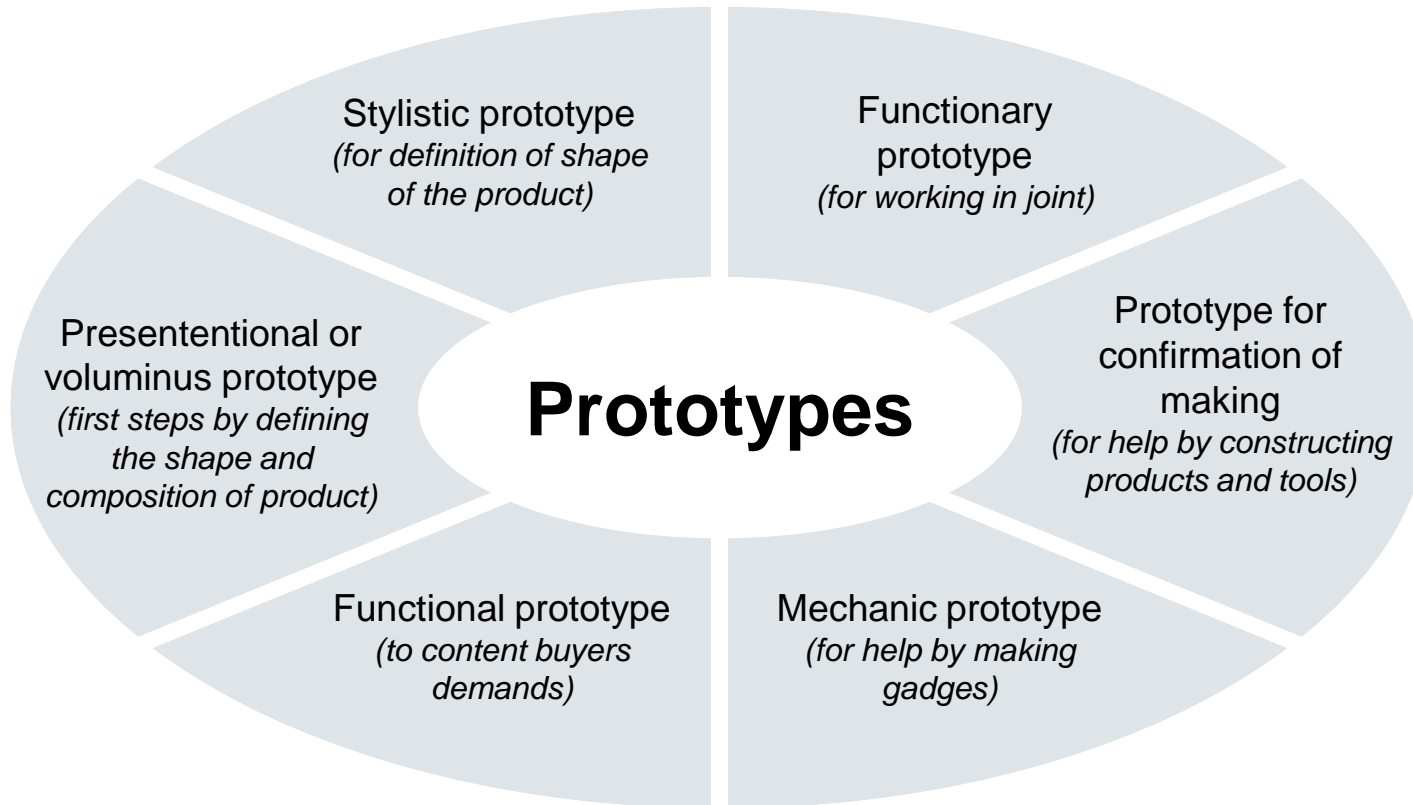
UL was for the third time listed within 500 best Universities worldwide according to Accademic World Ranking of Universities 2008 (so called "Shanghai list")
 UL was ranked to the class between 402 ÷ 503 out of 20.000 universities. In European region (Top European Universities) the UL was listed to the place rank between 169 and 201.
 Best University recognized worldwide is Harvard University, best European university is University of Cambridge.

The screenshot shows the website of the University of Ljubljana (UL) with a news article titled "UL ponovno uvrščena med 3% najboljših univerz na svetu". The article states that UL has been ranked among the top 500 universities worldwide for the third time in the 2008 Academic World Ranking. It also mentions that UL is ranked between 402 and 503 out of 20,000 universities globally, and between 169 and 201 in the European region. The article notes that Harvard University is the best worldwide, and the University of Cambridge is the best in Europe.

Source: <http://www.uni-lj.si/novica.aspx?id=1922>

Hella Saturnus Slovenija - Design & Development

Types of prototypes



Hella Saturnus Slovenija - Design & Development

Prototype workshop

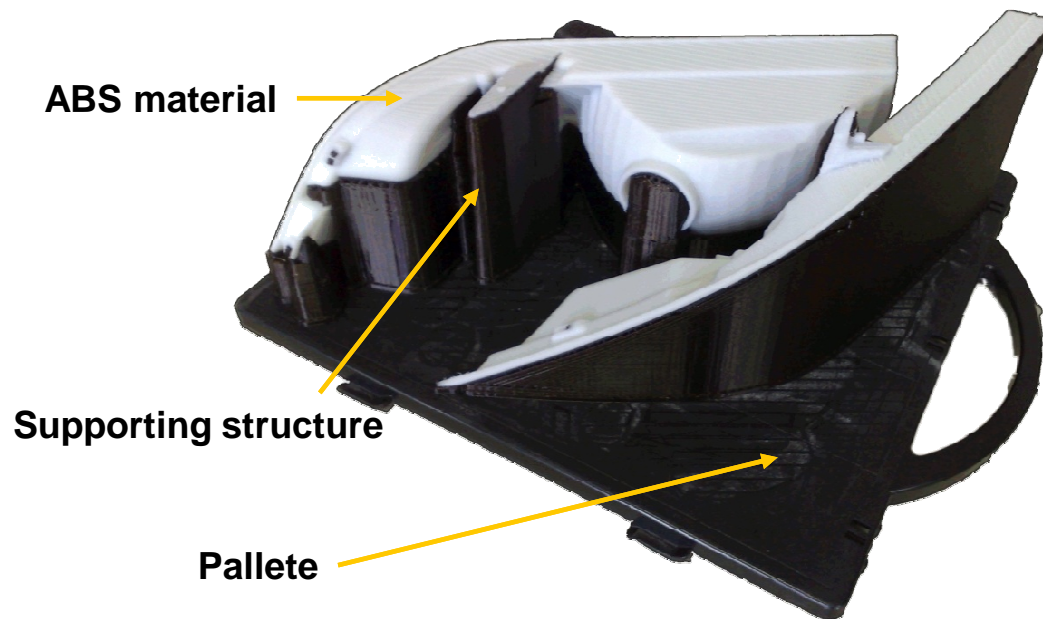
→ Prototype workshop:



HSS prototype workshop

Rapid prototyping

- Rapid prototyping – 2 x 3-D printer
 - For ABS material (max. 254 x 254 x 305 mm)
 - PC, Ultem, PPSF (max. 406 x 356 x 406 mm)
- Producing prototype components for design, quality planning, etc.
- Masters for silicon molds



THANK YOU!
THANK YOU!