



Diode-pumped Disc- and Rod Lasers for Advanced Cutting and Brazing Operations on the New Volvo V70 Models

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Volvo V70 & XC70 History



Volvo Duett, 1953 - 1969



Volvo Amazon, 1956 - 1970



Volvo 140, 1966 - 1973



Volvo 240, 1974 - 1993



Volvo 740, 1984 – 1992
Volvo 940, 1990 - 1998



Volvo 850, 1991 - 1997

Volvo V70 & XC70 History [cont.]



Generation I
1997 – 2000

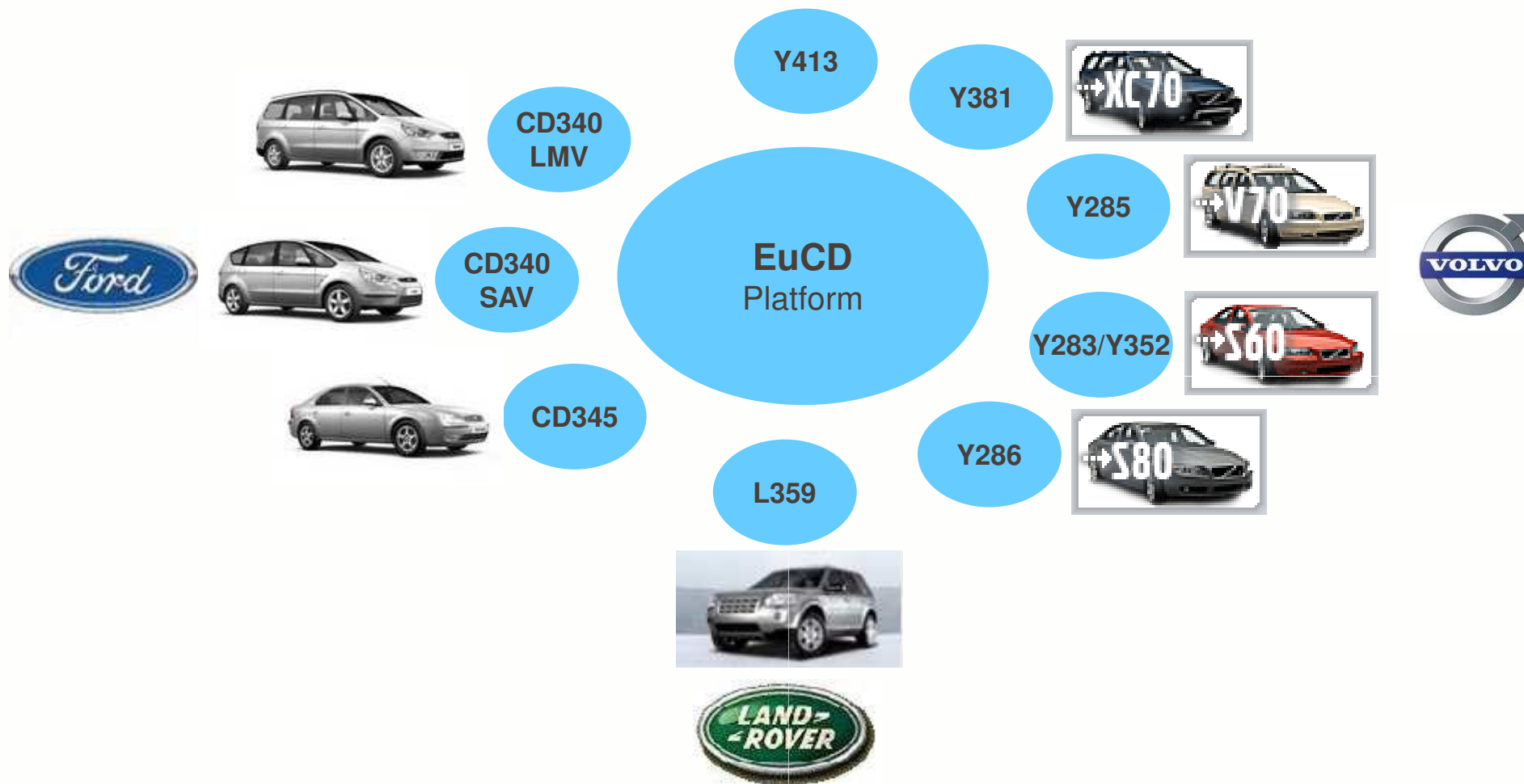


Generation II
2000 – 2007

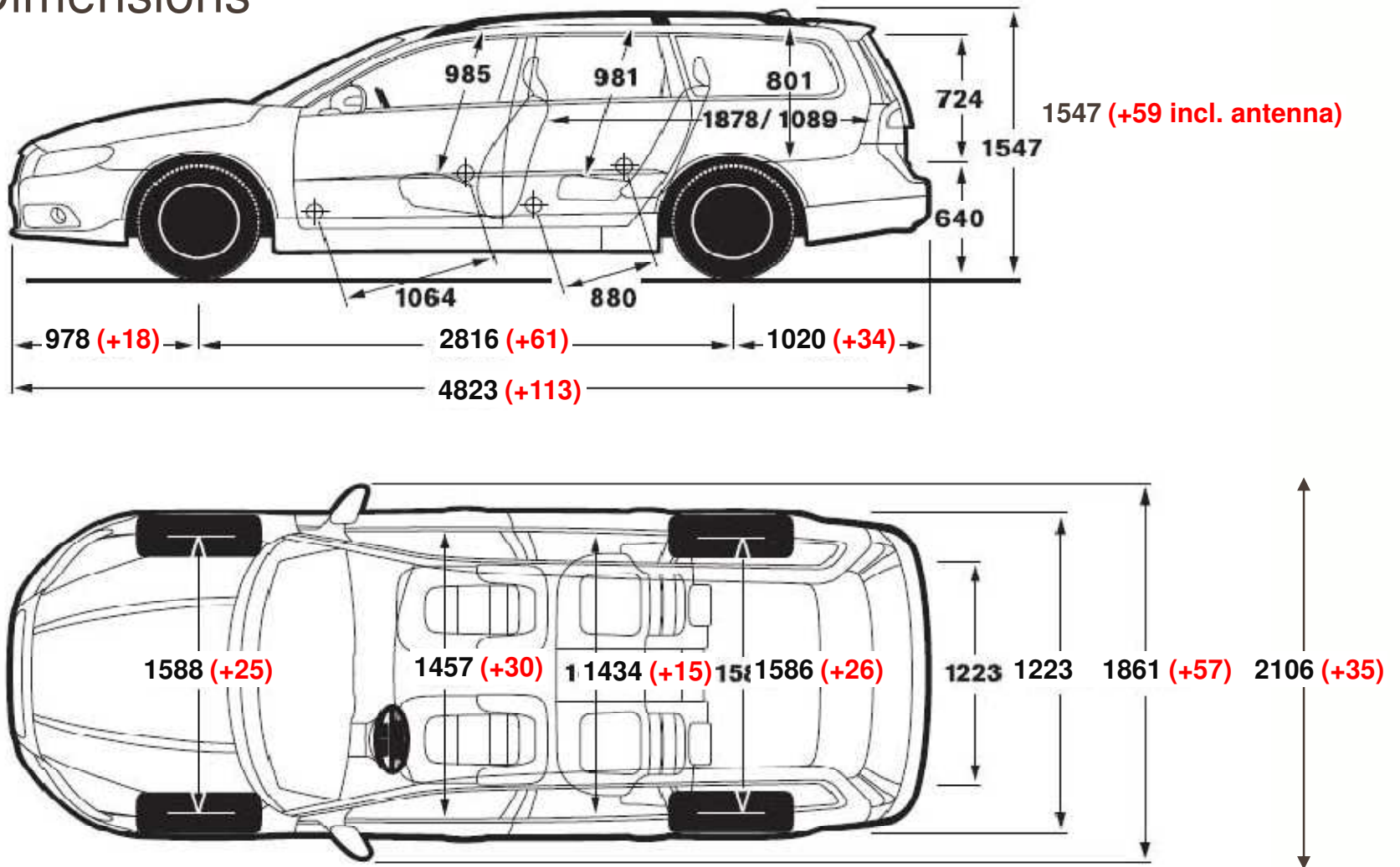


Generation III
2007 –

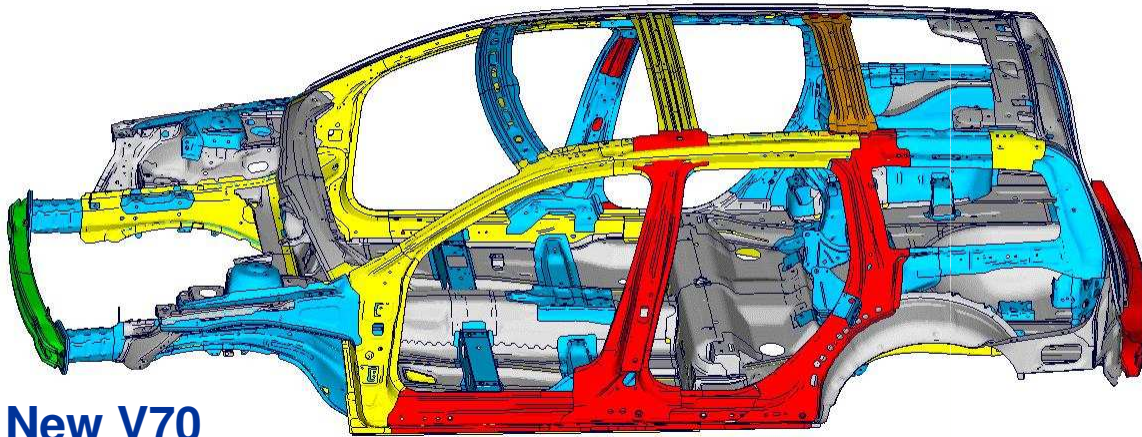
The EuCD Common Platform Programme



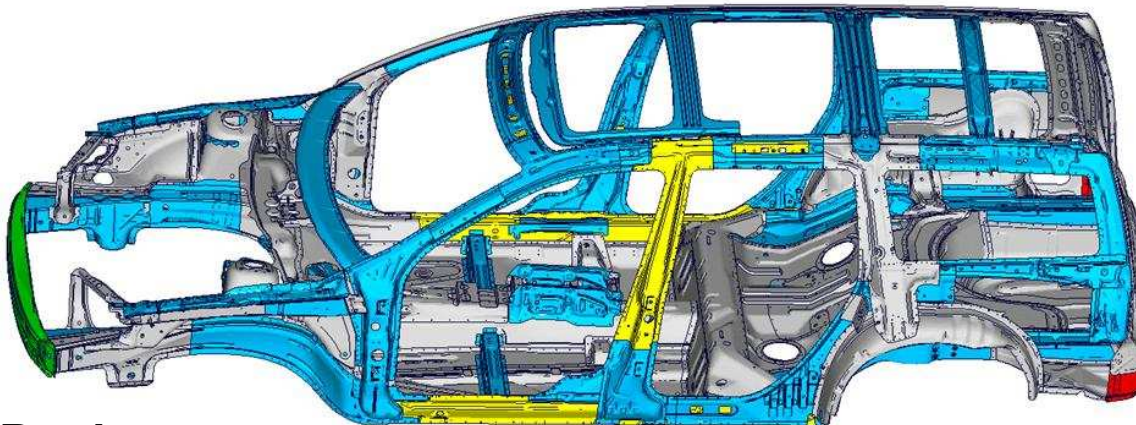
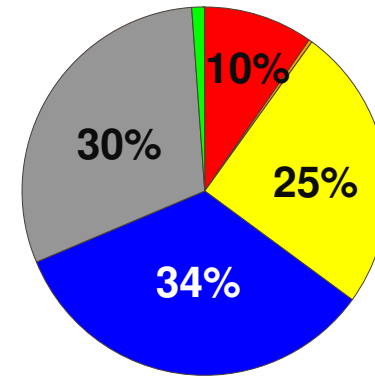
Main Dimensions



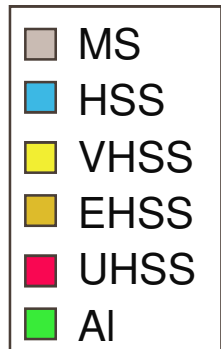
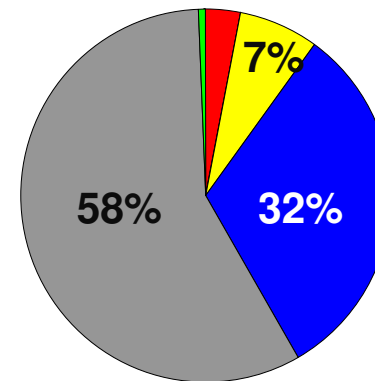
Materials



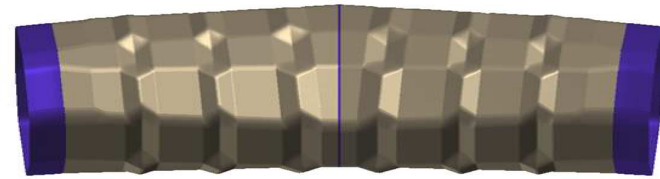
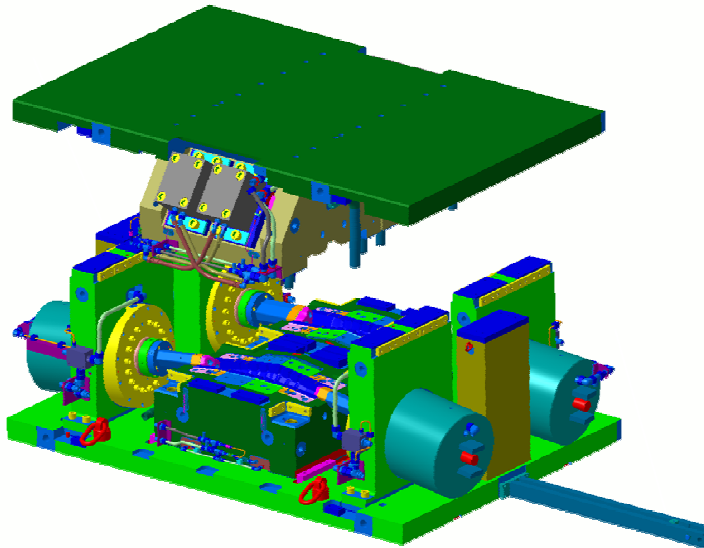
New V70



Predecessor



Technical Highlights #1; Hydroformed Crash Box



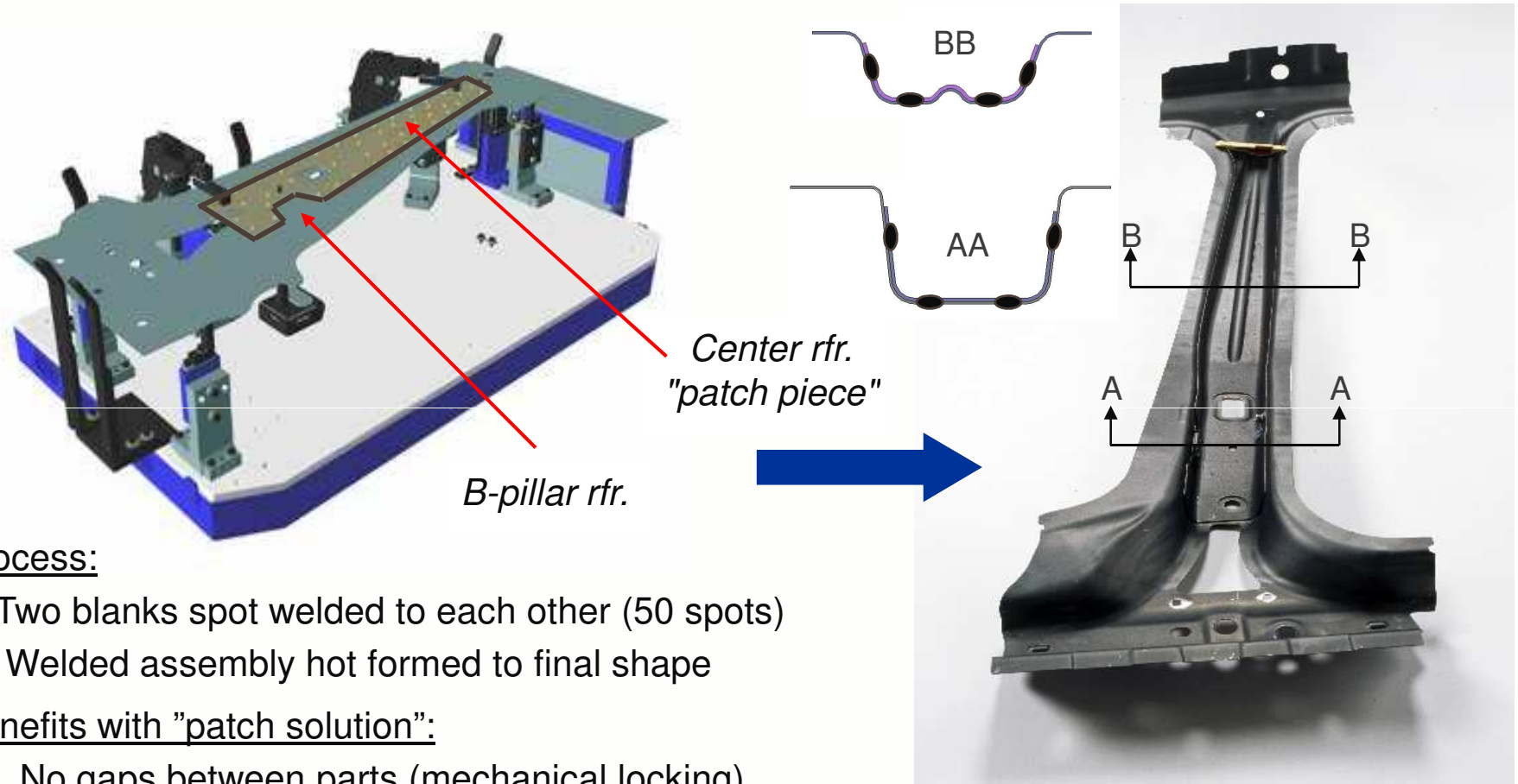
*Laser cutting to separate
LHS from RHS*

- * Two dies per press and two parts per die (i.e. four parts / stroke)
- * No scrap rate
- * No end trimming
- * Material and thickness can be changed without changing tool
- * Extremely good capability
- * Very good axial crush performance

Technical Highlights #1; Hydroformed Crash Box [cont.]



Technical Highlights #2; Hot Formed B-pillar rfr. with “Patch”



Process:

1. Two blanks spot welded to each other (50 spots)
2. Welded assembly hot formed to final shape

Benefits with "patch solution":

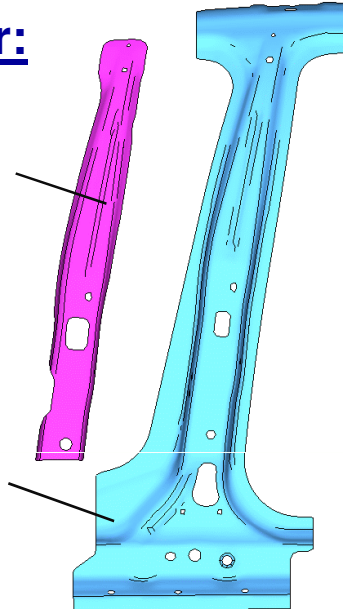
- ★ No gaps between parts (mechanical locking)
- ★ Possible to weld on all surfaces

Technical Highlights #2; Hot Formed B-pillar rfr. with “Patch” [cont.]

V70 B-pillar:

“Patch piece”
2.0 mm, Boron

B-pillar reinf.
1.4 mm, Boron

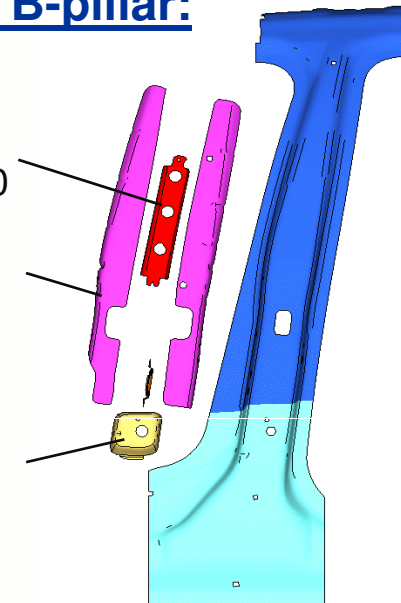


Alternative B-pillar:

Center reinf
1.5 mm, DP600

Center reinf.
1.2 mm, Boron

Hinge reinf.
1.5 mm



B-pillar reinf.
1.95 mm, DP600

TWB

B-pillar reinf.
1.35 mm

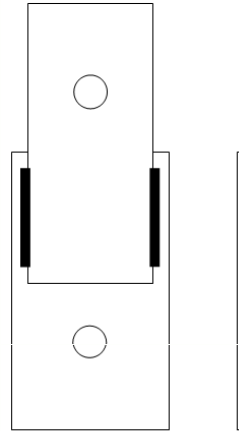
Material cost	+ 10.9 €/car
Assembly cost	-12.7 €/car
Cost reduction	1.8 €/car
Part reduction	8 parts / car
Weight reduction	0,5 kg/car

Advantages with “patch solution”:

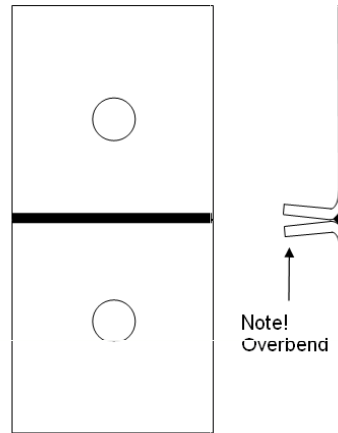
- * Lighter, cheaper and stronger
- * Improved door-sag performance

Fatigue Behaviour of Laser Brazed Joints – Test Plan

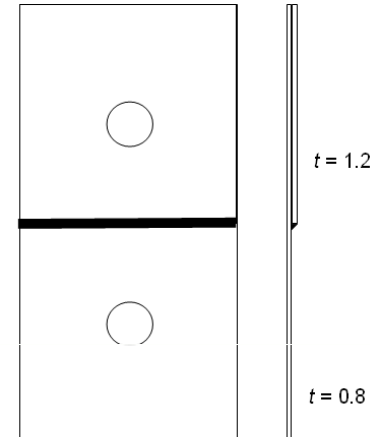
Edge overlap
2 stitch longitudinal
(brazing, shear)



Beam trap
(cont, flush)



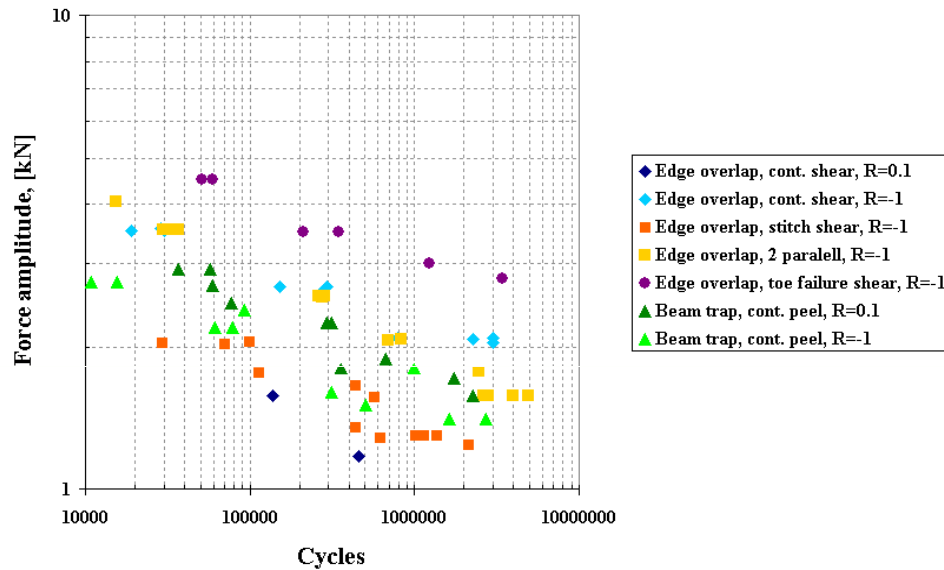
Edge overlap
toe failure



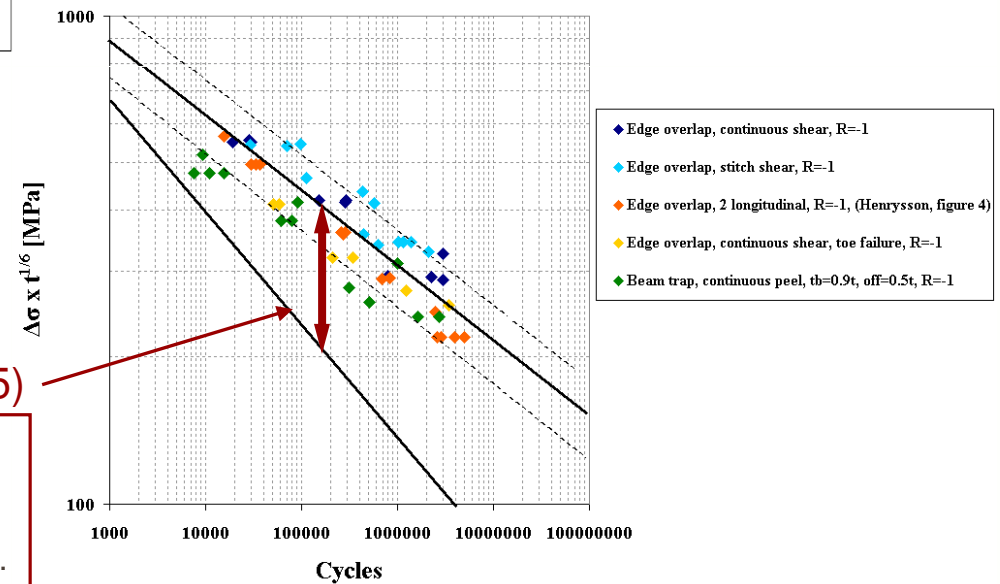
<u>Specimen</u>	<u>Test series</u>
Edge overlap cont	CA peel $R=0.1$
Edge overlap cont	CA shear $R=-1$
Edge overlap stitch	CA shear $R=-1$
Edge overlap, 2 stitch longitudinal	CA shear $R=-1$
Edge overlap cont	VA shear $R=-1$
"Beam trap" cont	CA $R=0.1$
"Beam trap" cont	CA $R=-1$
"Beam trap" cont	VA $R=-1$
Edge overlap, toe failure	CA $R=-1$

Fatigue Behaviour of Laser Brazed Joints – Results

Test data, overlap shear and beam trap specimens



S-N data, stress ratio R=-1



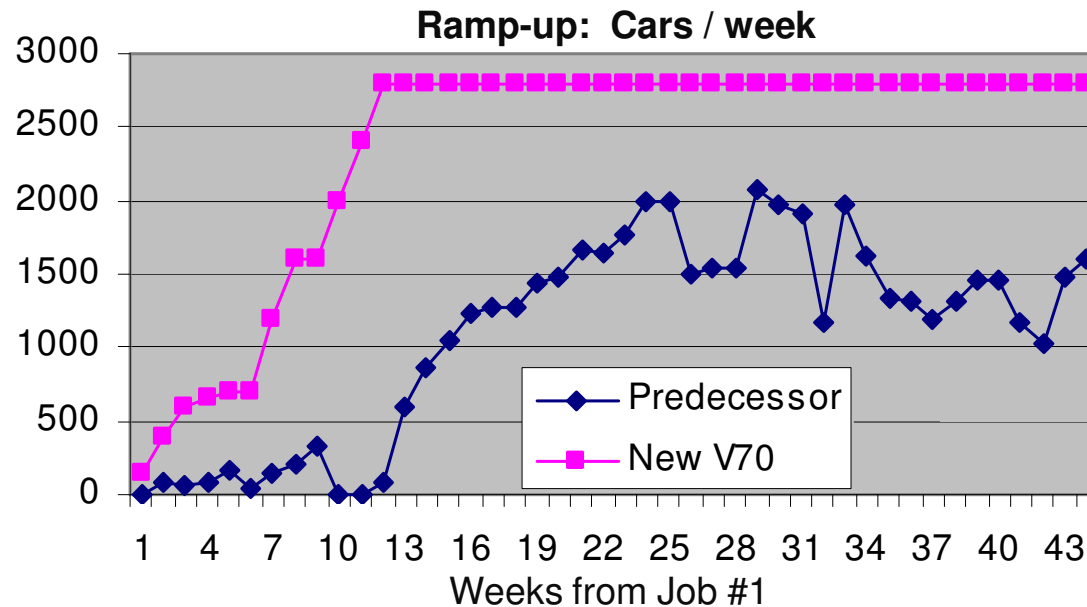
Design curve (Y285)

Note!

No additional CAE margin introduced here.
Ideal specimen S-N curve only lowered to take actual body joint heights and gaps into account.

Manufacturing – Major Milestones

Activity	2006												2007			
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April
Pre-series (Pilot plant)			F31		F32											
Pre-series (Body shop)							MTO	F33			PTO					
Job #1																



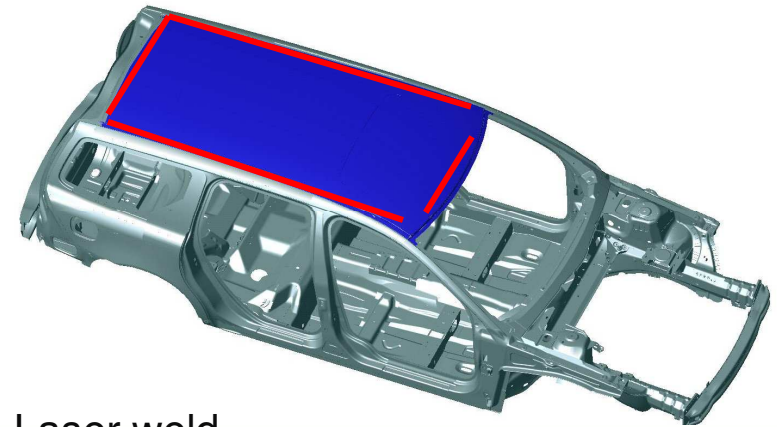
Production during weekends (60 bodies)

Mixed production day time S80/V70 (150 bodies)

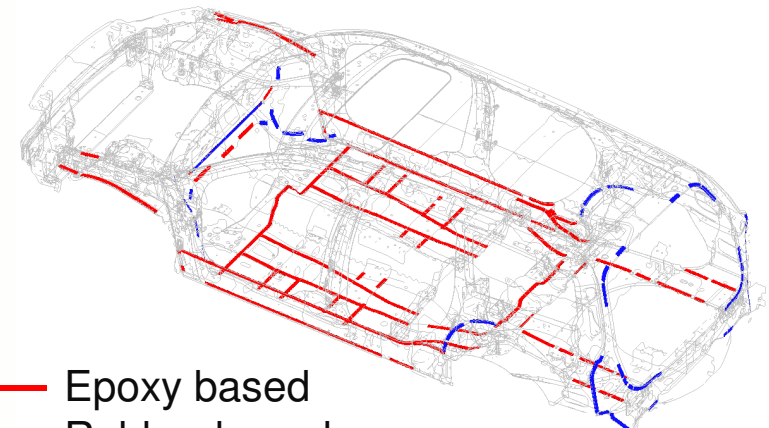
Manufacturing – Key Figures

	New V70	Predecessor
BIW body parts	285	258
Spot welds	4170	4595
MAG weld	5.5 m*	4.6 m*
<i>Laser weld</i>	<i>5.7</i>	<i>3.7 m</i>
<i>Laser braze</i>	<i>1.3 m</i>	<i>0 m</i>
<i>Epoxy adhesive</i>	<i>24.9 m</i>	<i>1.1 m</i>
<i>Rubber adhesive</i>	<i>16.2 m</i>	<i>0 m</i>
Hotmelt	19.8 m	30.5 m
Anti flutter	2.8 m	2.4 m

(*) 2 m MAG-weld for door hinges



— Laser weld



— Epoxy based
— Rubber based

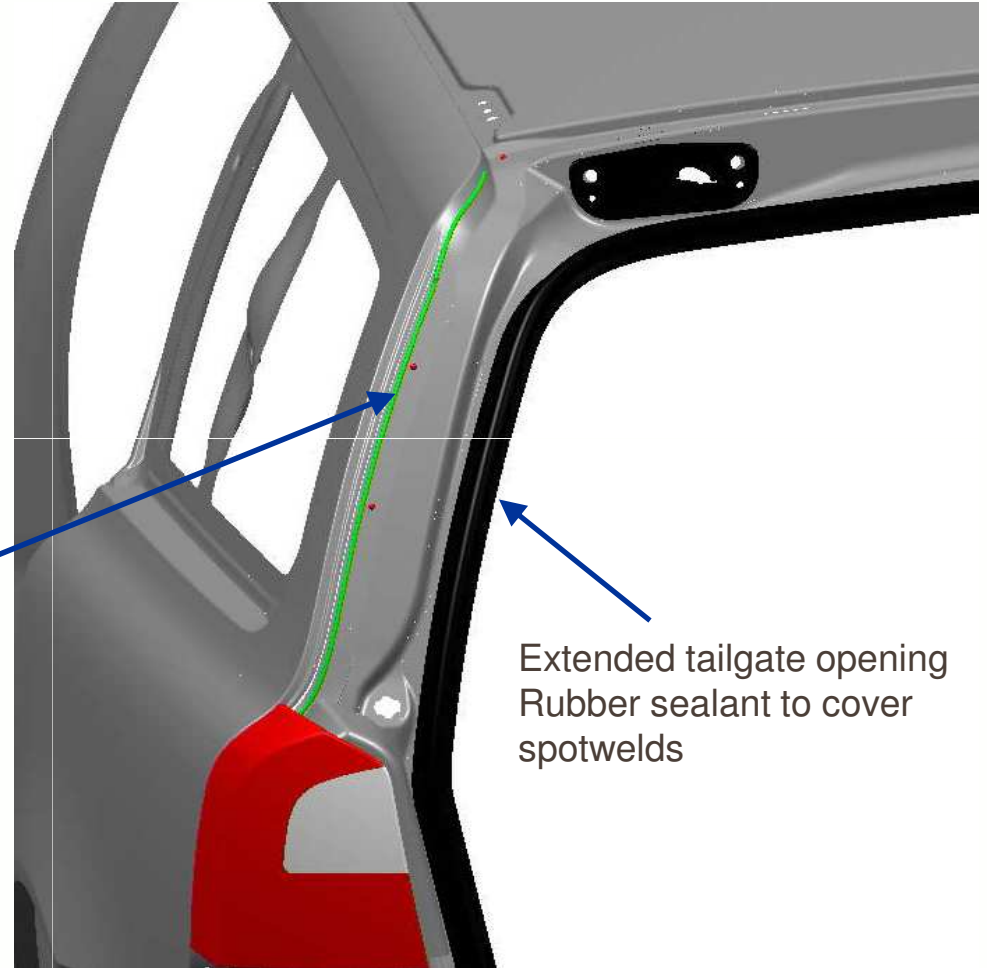
The All New V70 Laser Brazed Tailgate Opening



Painted, visible laser
brazed connection

● Geo Spotwelds

— Laserbrazed

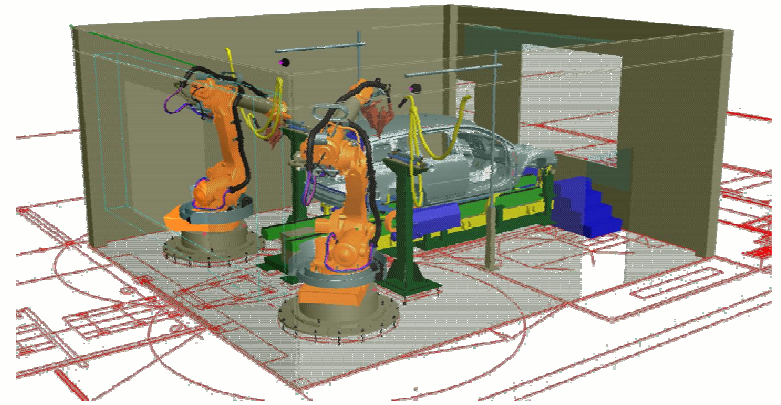


Extended tailgate opening
Rubber sealant to cover
spotwelds

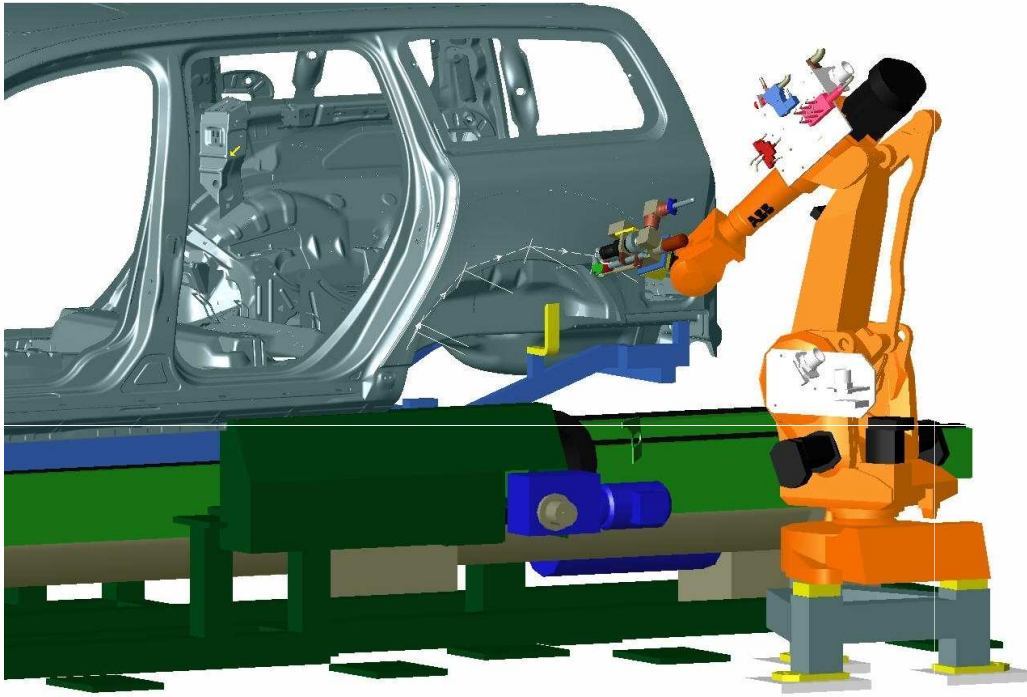
Laser Brazing Station

Torslanda Plant

- ★ Laser Brazing, 2x 690 mm
- ★ Cycle time: 67 sec., actual: 61,5 sec.
- ★ Laser: 1x3 kW Rofin DY030HP, 2 fibers used
- ★ Robots: 2xABB 6550-3.2
- ★ Tools: 2x HighYAG brazing tools with tactile finger
- ★ Fronius hot wire
- ★ KUKA Quadrodrive wire feeding
- ★ TCP-check
- ★ de-light power measurement



Laser Precision Hole Cutting for Plastic Trim on XC Versions



- ★ 5 holes per side (only difference between V70 & XC70 bodies)
- ★ 750 W laser source
- ★ Tolerances ± 1.5 mm

VCC Product Range & Laser Applications

S SEDAN ▾

VOLVO
S40



VOLVO
S60



VOLVO
S80



V VERSATILITY ▾

VOLVO
V50



VOLVO
V70



XC CROSS COUNTRY / SUV ▾

VOLVO
XC70



VOLVO
XC90



C COUPÉ / CONVERTIBLE ▾

VOLVO
C30



VOLVO
C70



Laser welding
Laser brazing

XC60 Y413
SOP 08w35



Thank you for your attention!



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