

NEW DIE TECHNOLOGY TO SAVE MONEY BY FINE TUNING THE THICKNESS OF THE PARISON

Dr. Ing. Heinz Gross, Kunststoff-Verfahrenstechnik, Germany

Introduction

Description of the basic idea

How to integrate a flex ring into the die

Description of the test set up and of the achieved results

Future prospects



SPE ABC Conference, Bartlesville, October 8-9, 2008

Complexity of blow moulded parts increases steadily

- Requests of designers
- Technical requirements



It will probably become more and more difficult to achieve a satisfactory wall thickness distribution in critical a blow molded parts





SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008

Cost of a blow molded part

The cost of a part depends by more than 50 % from the material which is used to produce the it

Task for extrusion blow molders

Improve the technology in order to be able to produce lighter parts without losing applicational properties



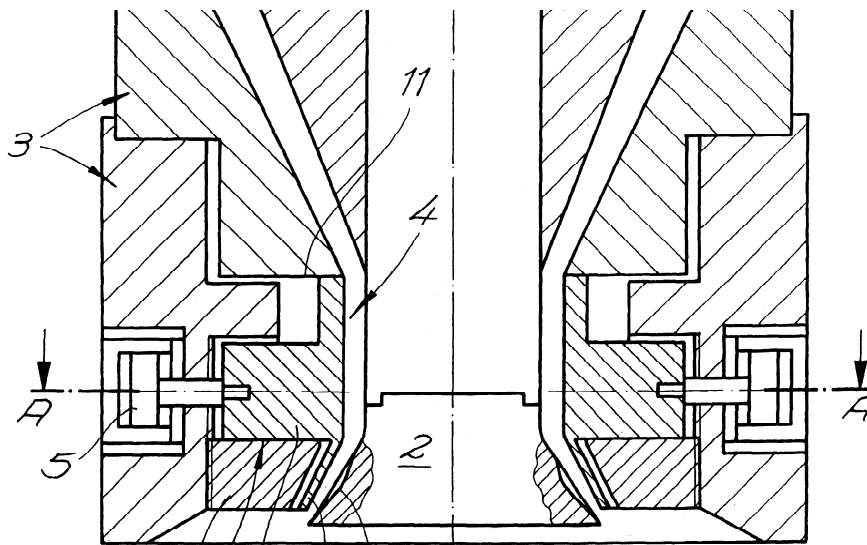
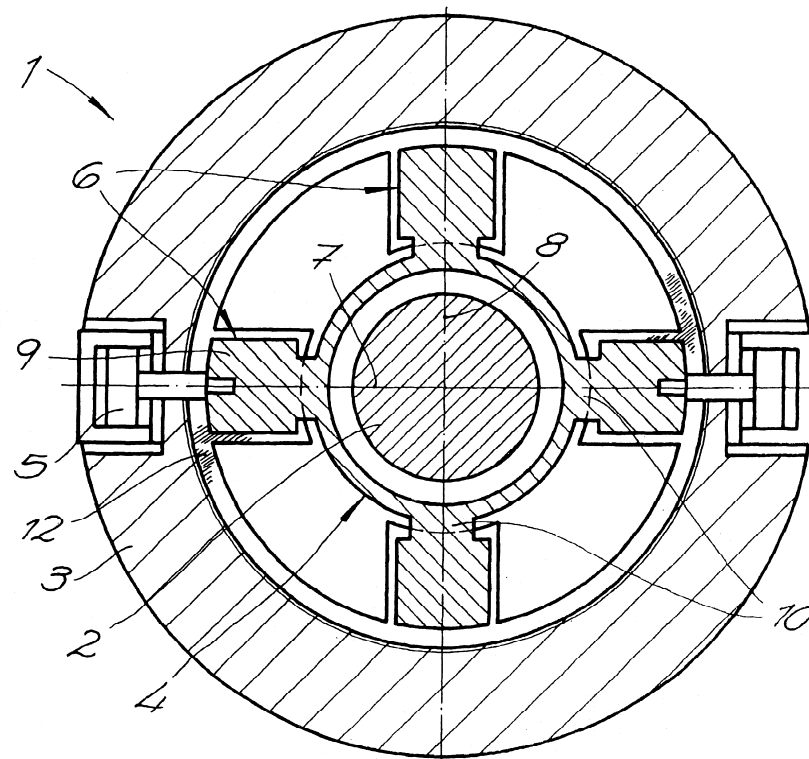
SPE ABC Conference, Bartlesville, October 8-9, 2008

Technical solutions

- Axial wall thickness programming
- Radial wall thickness programming

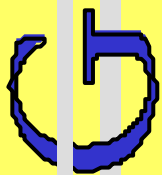
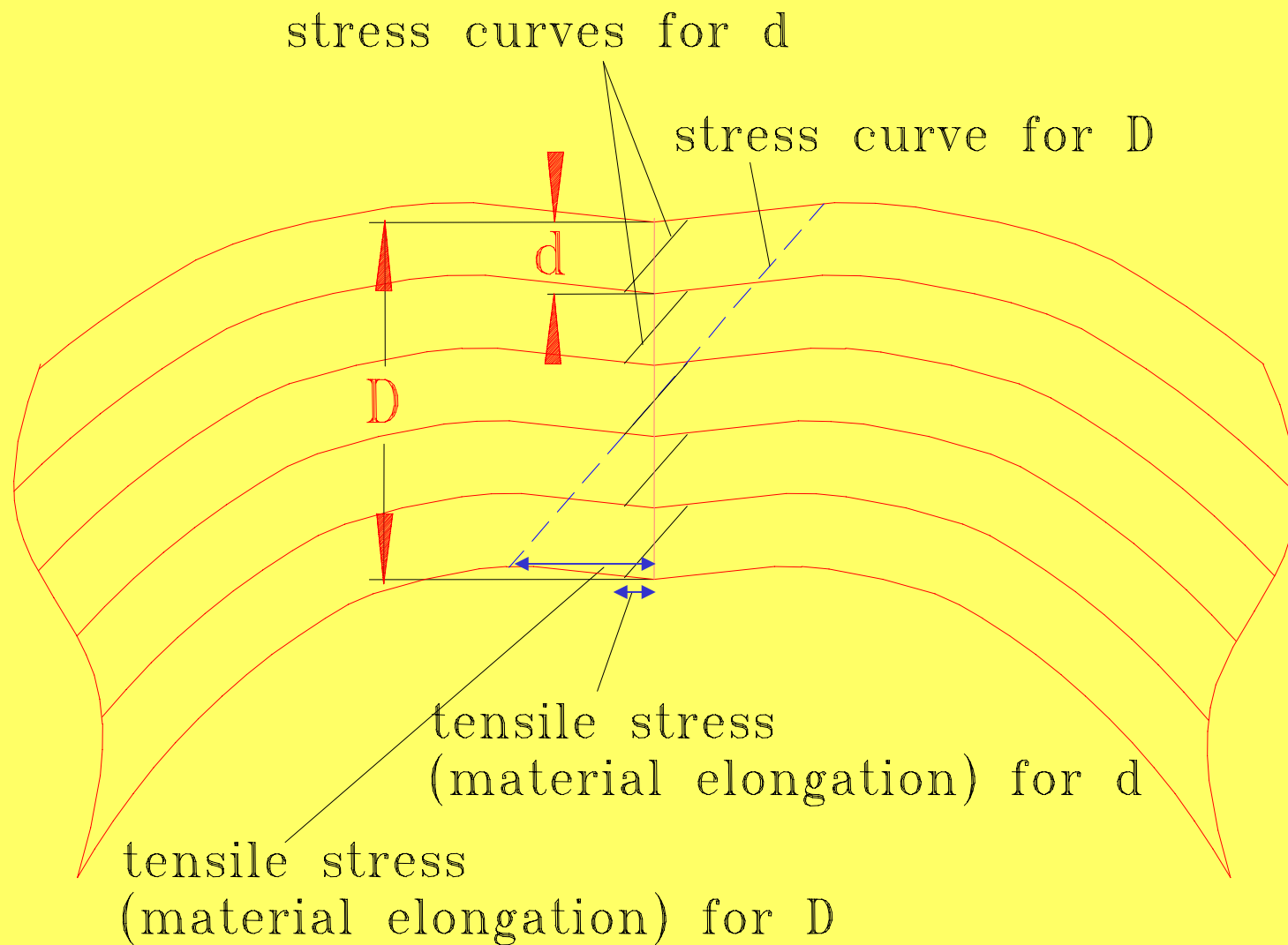


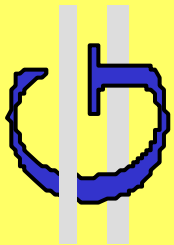
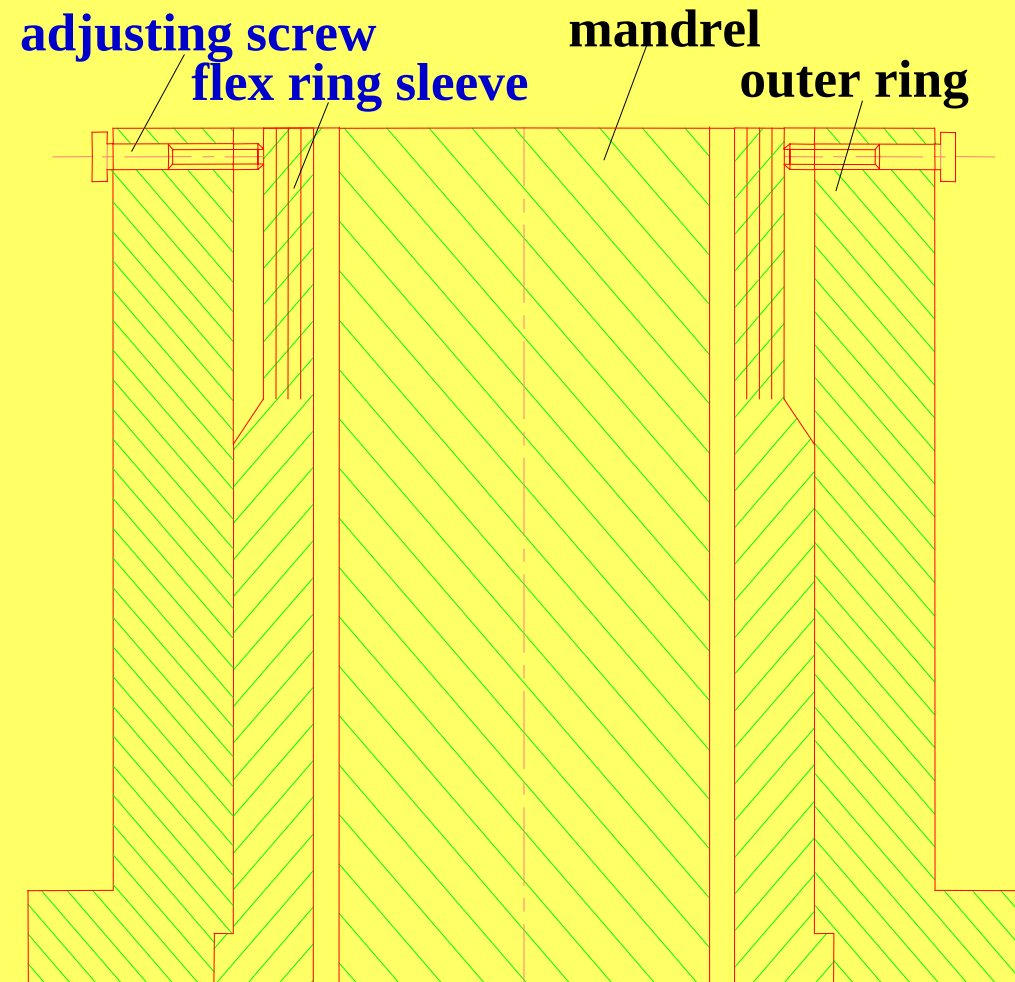
SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE, ABC Conference, Bartlesville, October 8-9, 2008







flex ring die

SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008

Practical tests with the die for the bottle

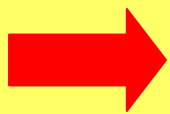
Wall thickness in the oval region of the bottle

	max.	min.	diff.
Original annular shape	1.7 mm	0.6 mm	1.1 mm
Optimized shape reached by deforming the flex ring	1.4 mm	1.0 mm	0.4 mm



Findings of the first manual tests

- The flow channel geometry can be changed by deforming the flex ring



The wall thickness of the parison and the product can be influenced in the wanted way

- A very sensitive fine tuning between the stiffness of the flex ring and the distance from screw to screw is necessary
- An automatic adjustment of the flex ring geometry should be possible
- The shape of the parison exiting the die is negatively affected by the deformation of the flex ring





Versuchswerkzeug im Einsatz

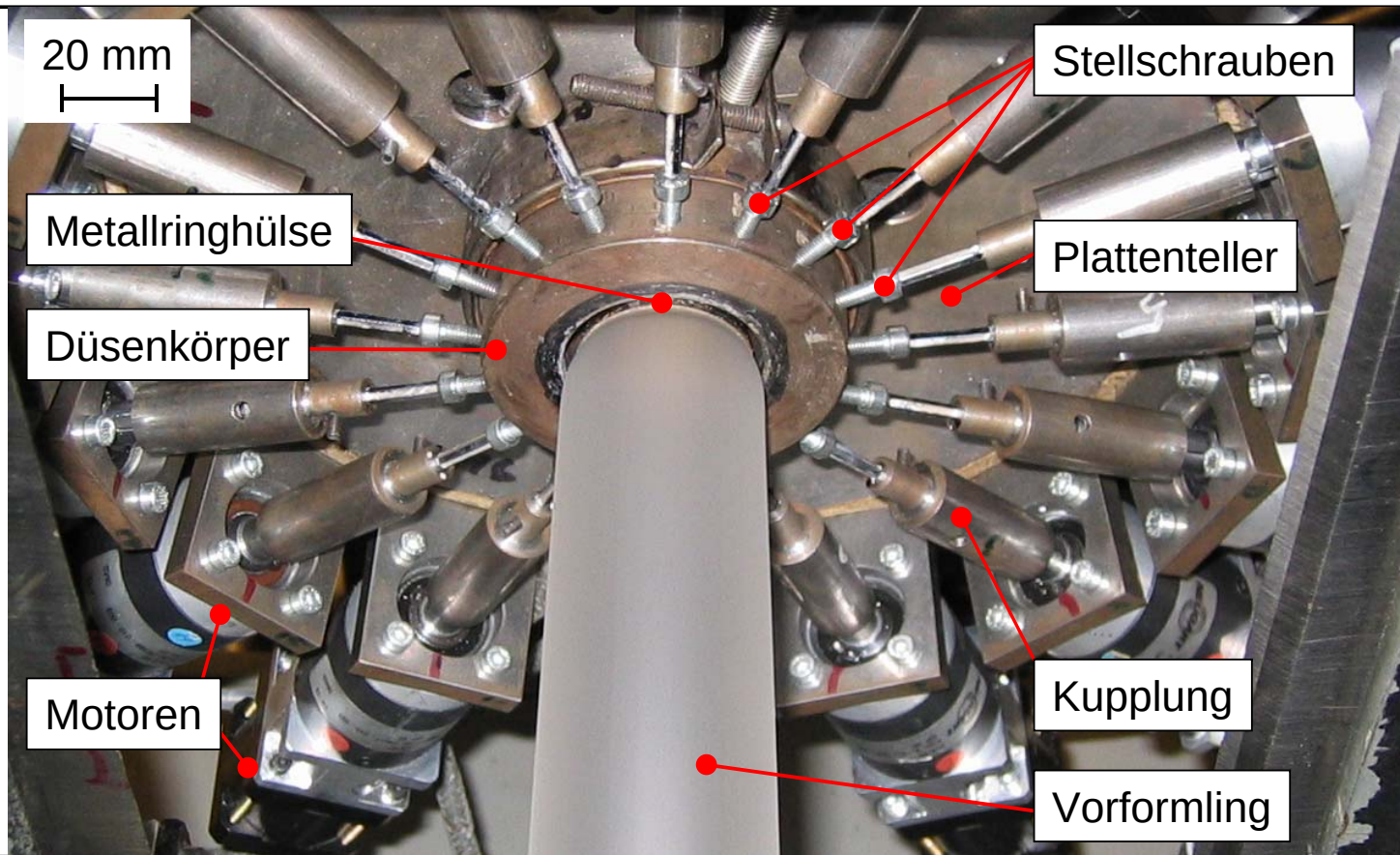
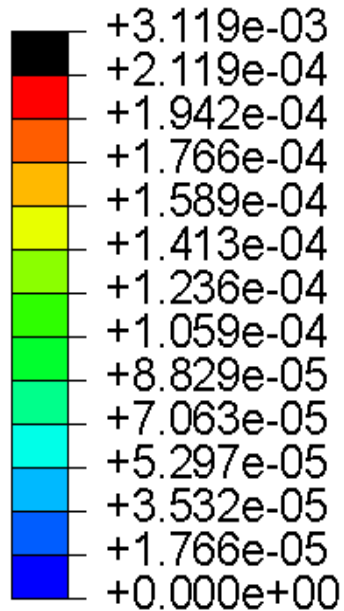


Bild 7

Gesamtdeformation der Flexringhülse

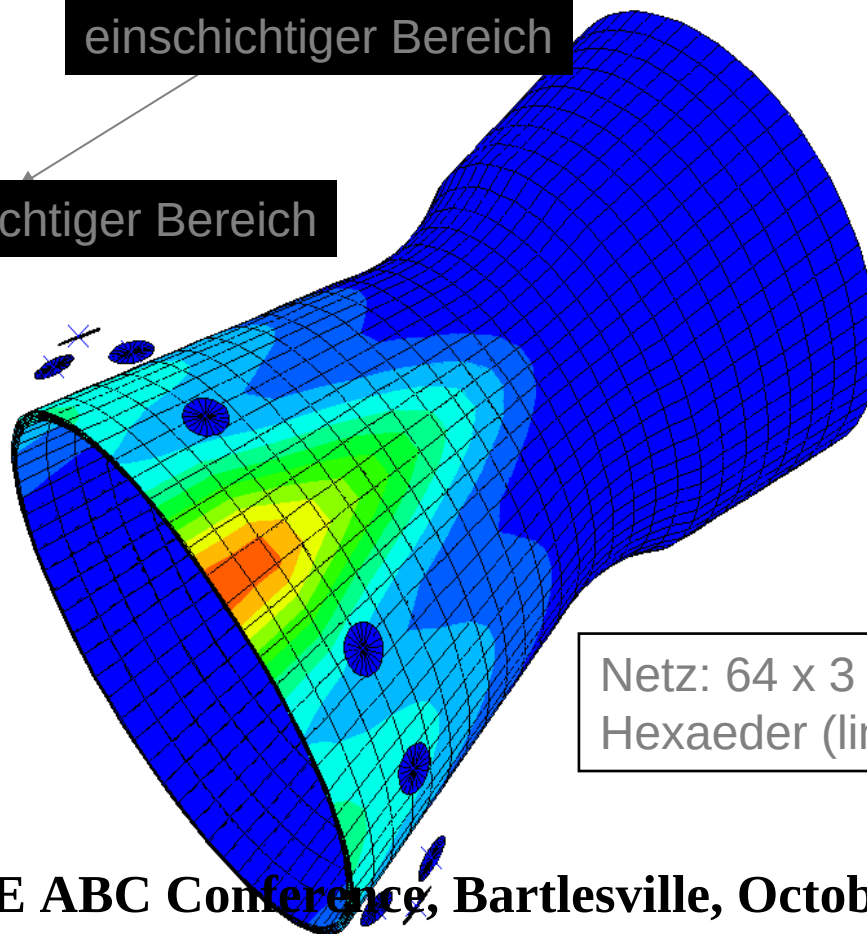
U, Magnitude [m]



FEM-Simulation)

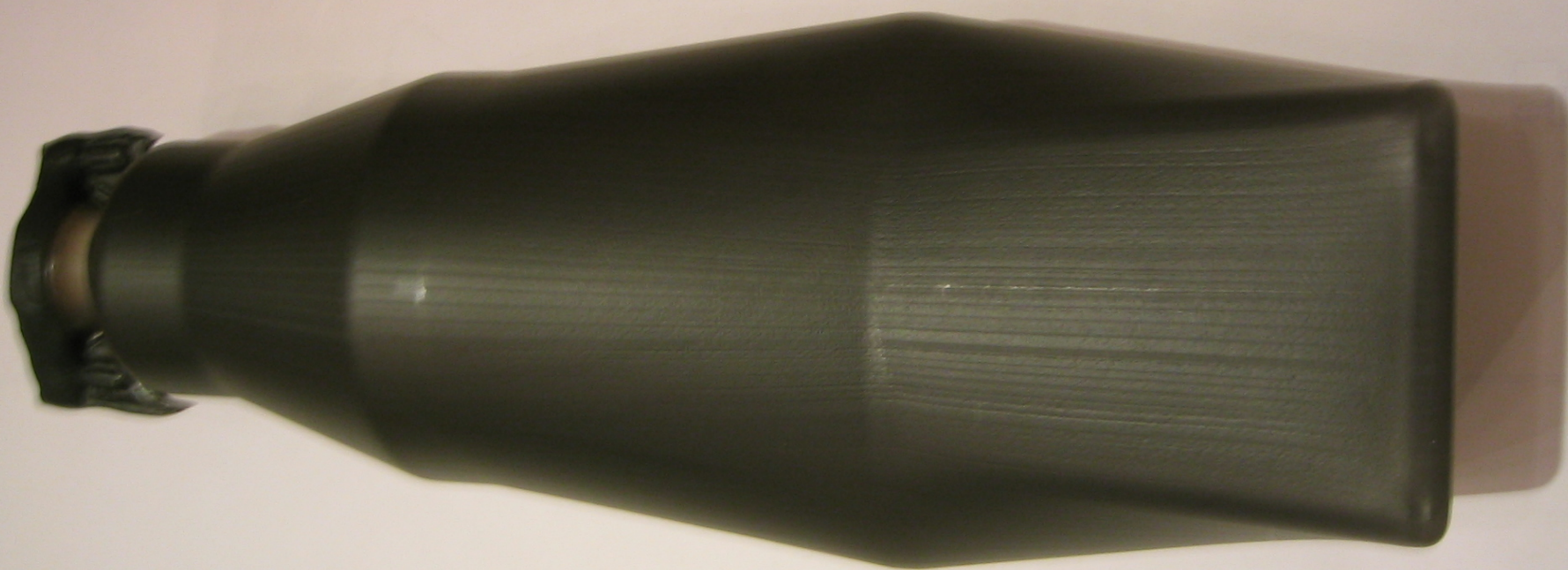
einschichtiger Bereich

dreischichtiger Bereich

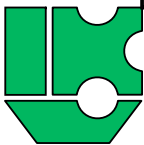


Netz: 64 x 3
Hexaeder (linear + red.)

SPE ABC Conference, Bartlesville, October 8-9, 2008

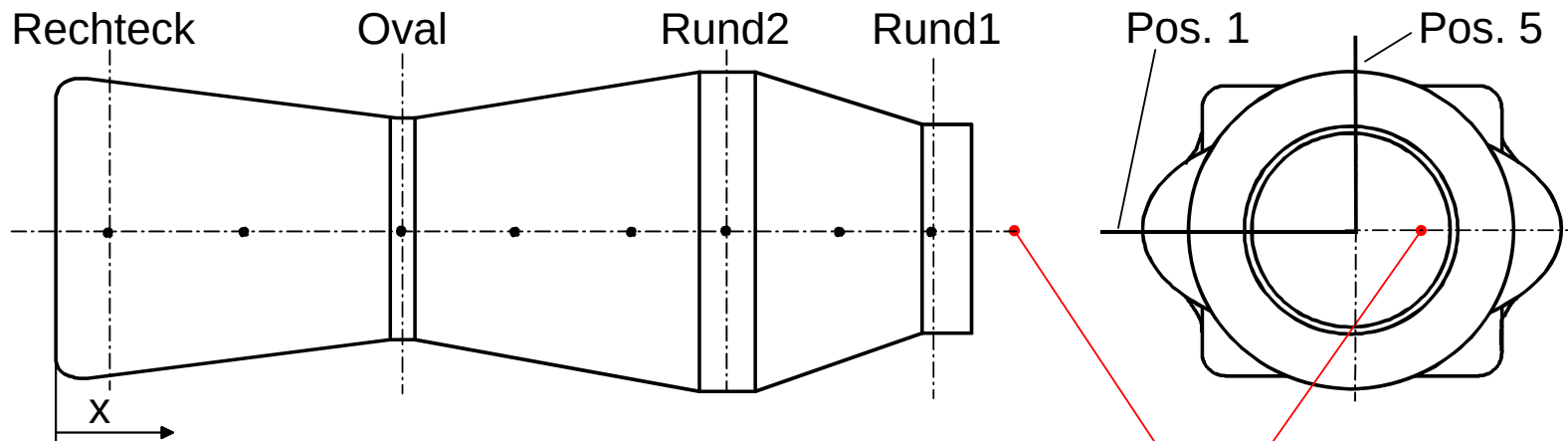


SPE ABC Conference, Bartlesville, October 8-9, 2008

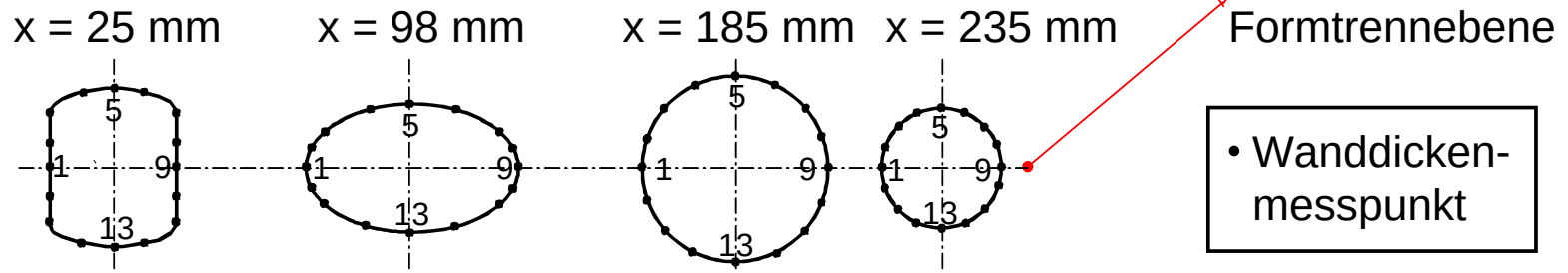


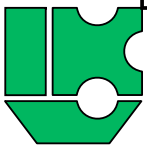
Lage der Waddickenmesspunkte

Messpunkte über der Länge:



Messpunkte über dem Umfang:





Wanddickenverteilung bei kreisrundem Düsenaustrittsspalt

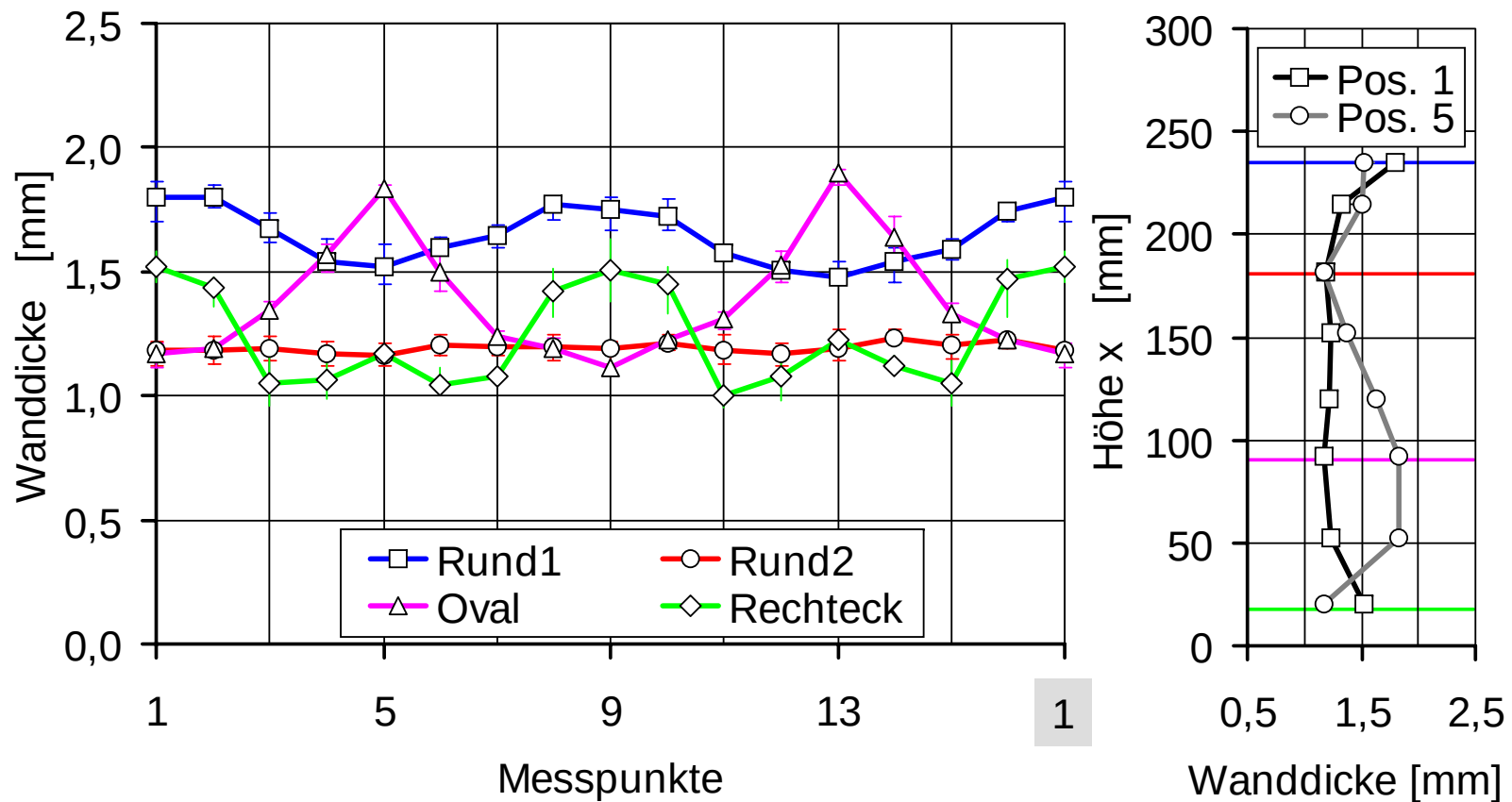
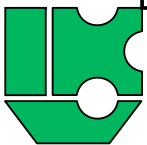
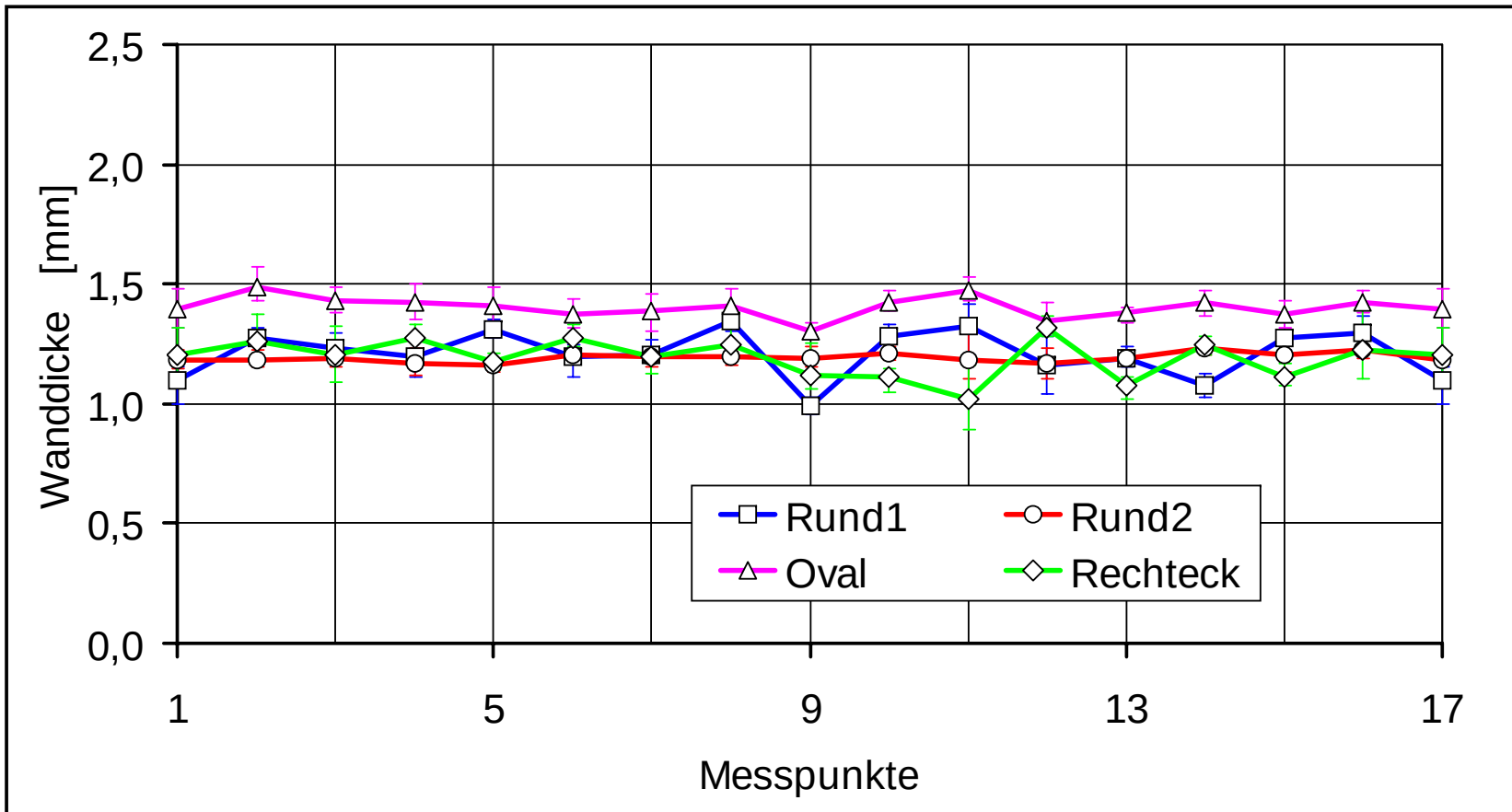
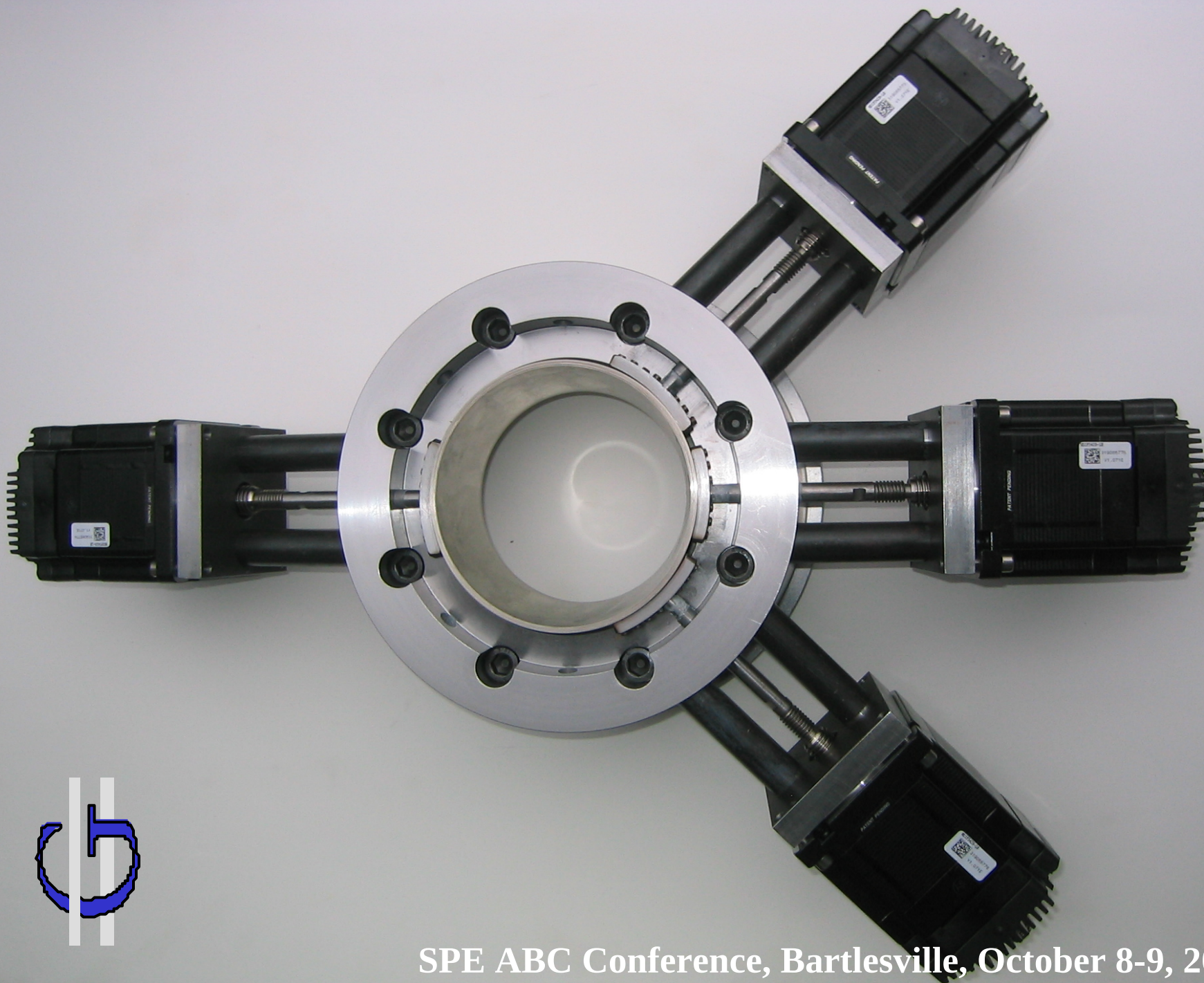


Bild 14

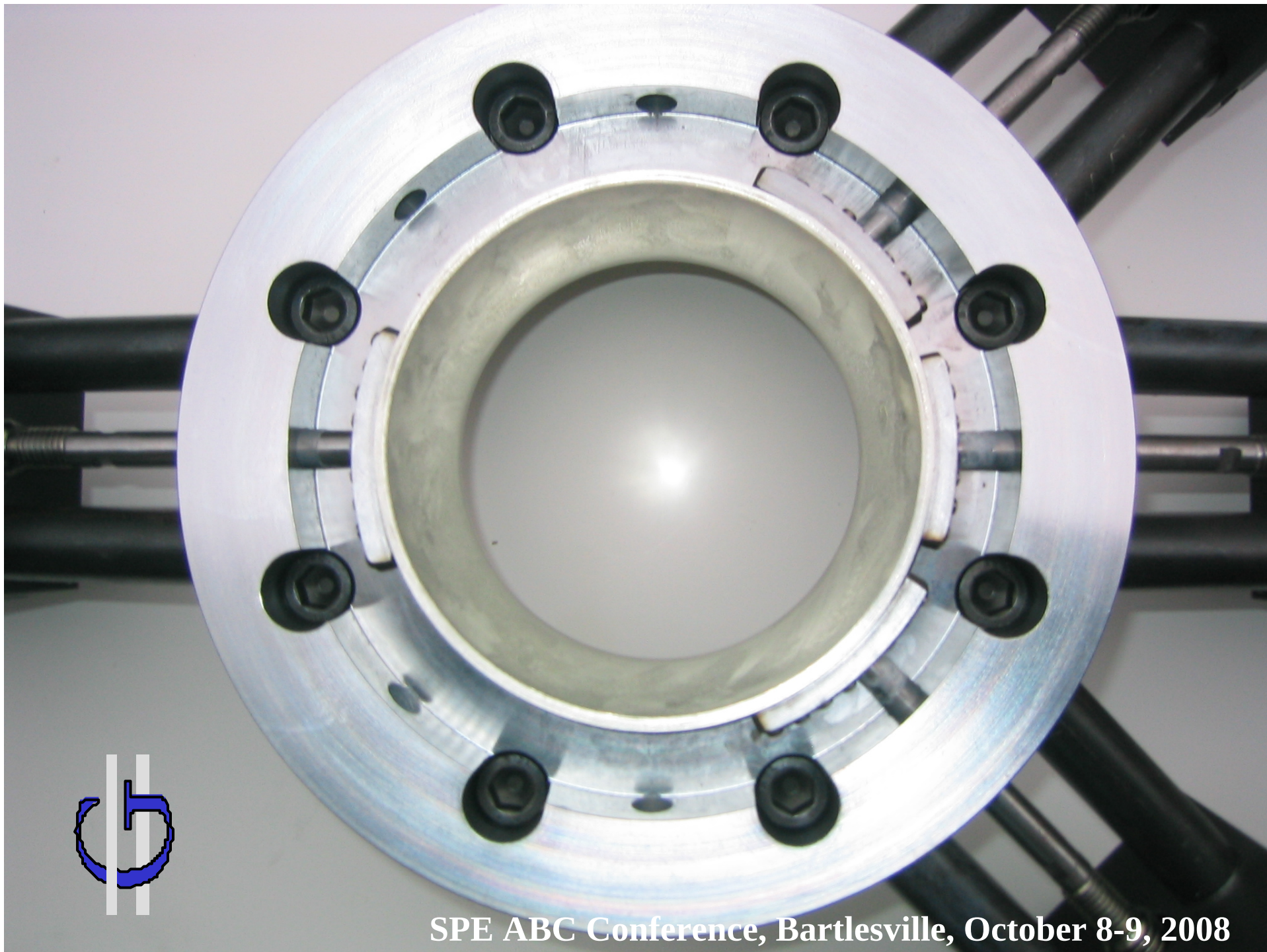


Wanddickenverteilung in den Schnittebenen bei optimaler statischer Hülsendeformation





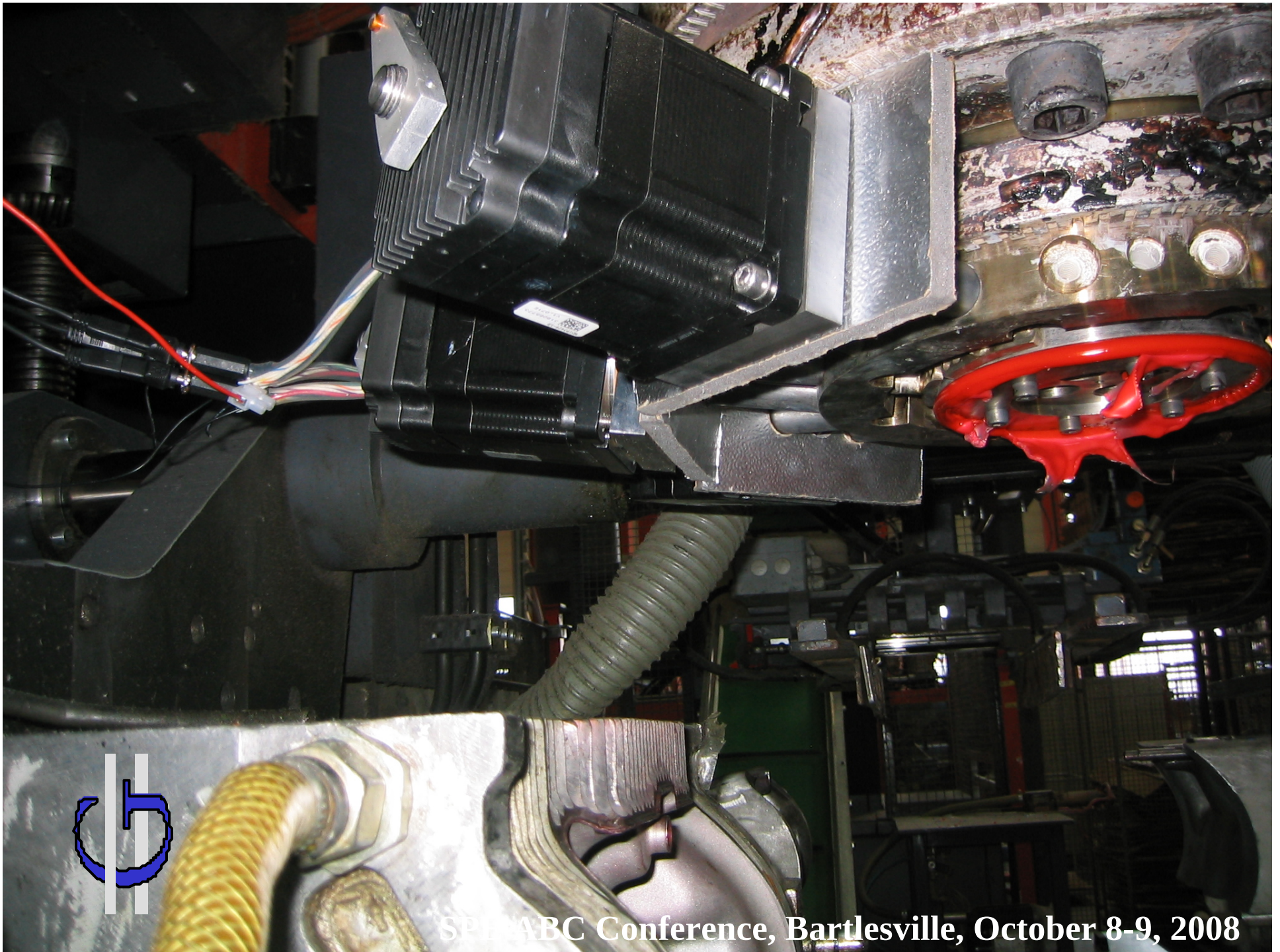
SPE ABC Conference, Bartlesville, October 8-9, 2008



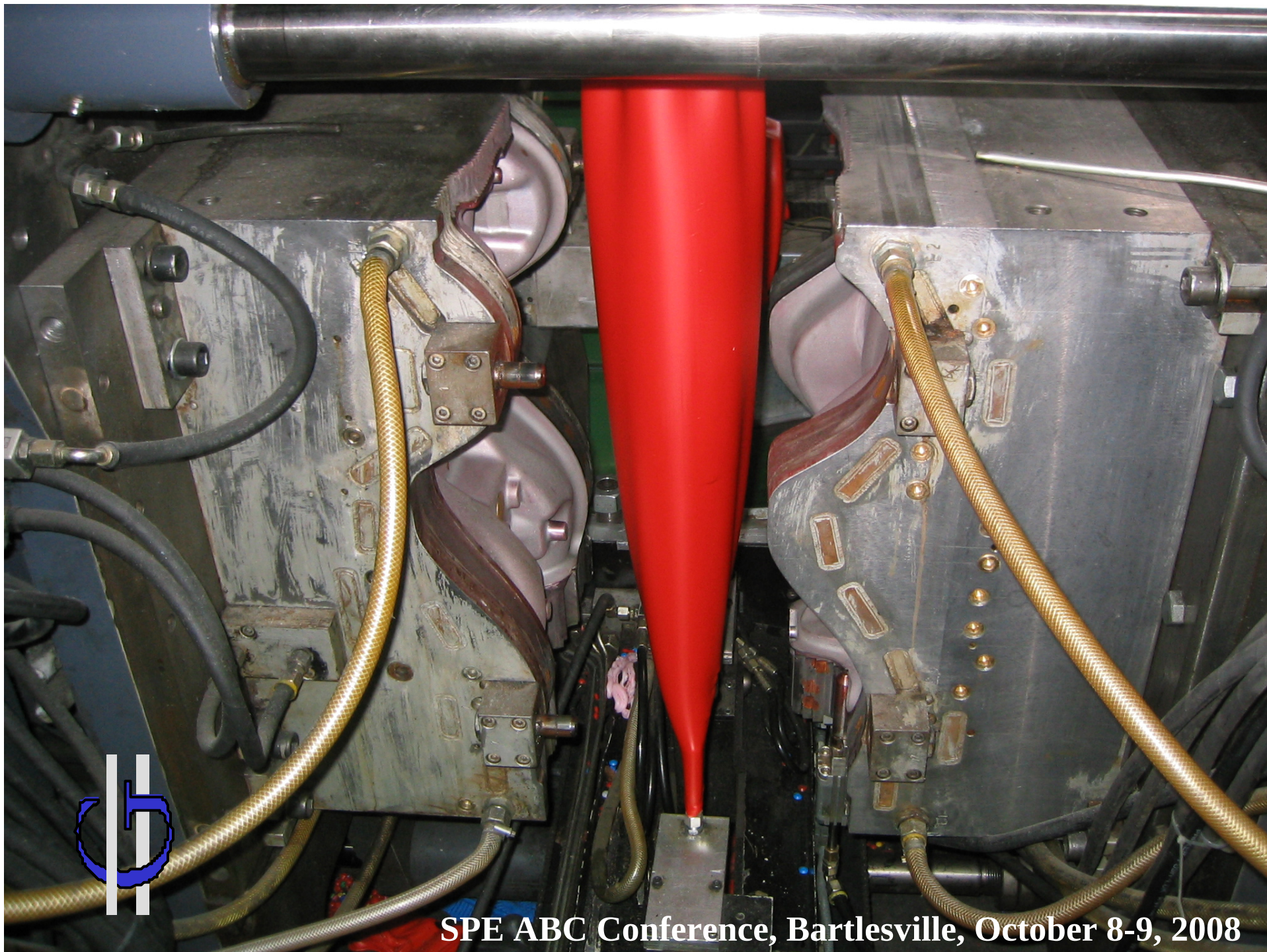
SPE ABC Conference, Bartlesville, October 8-9, 2008



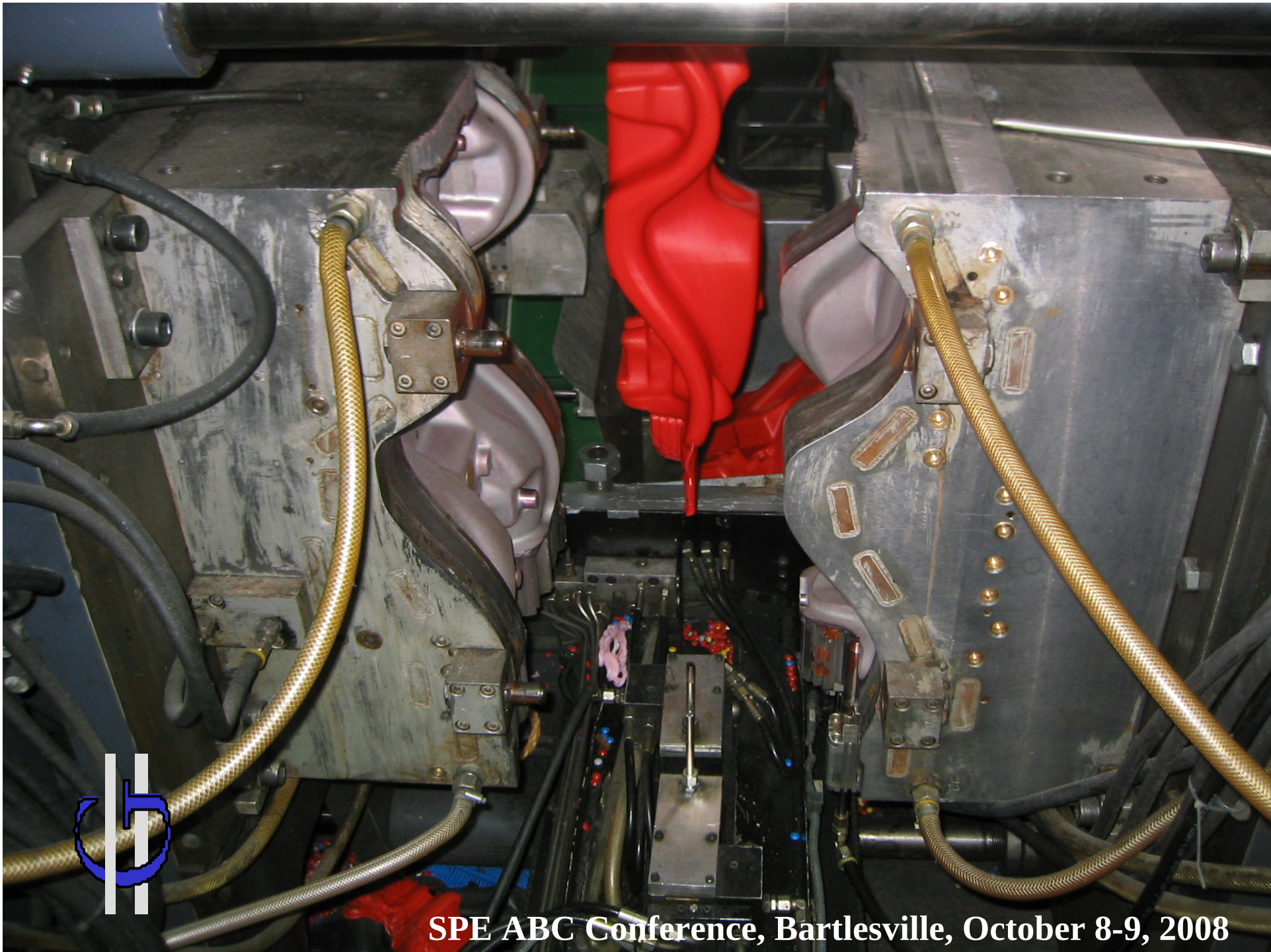
SPE ABC Conference, Bartlesville, October 8-9, 2008



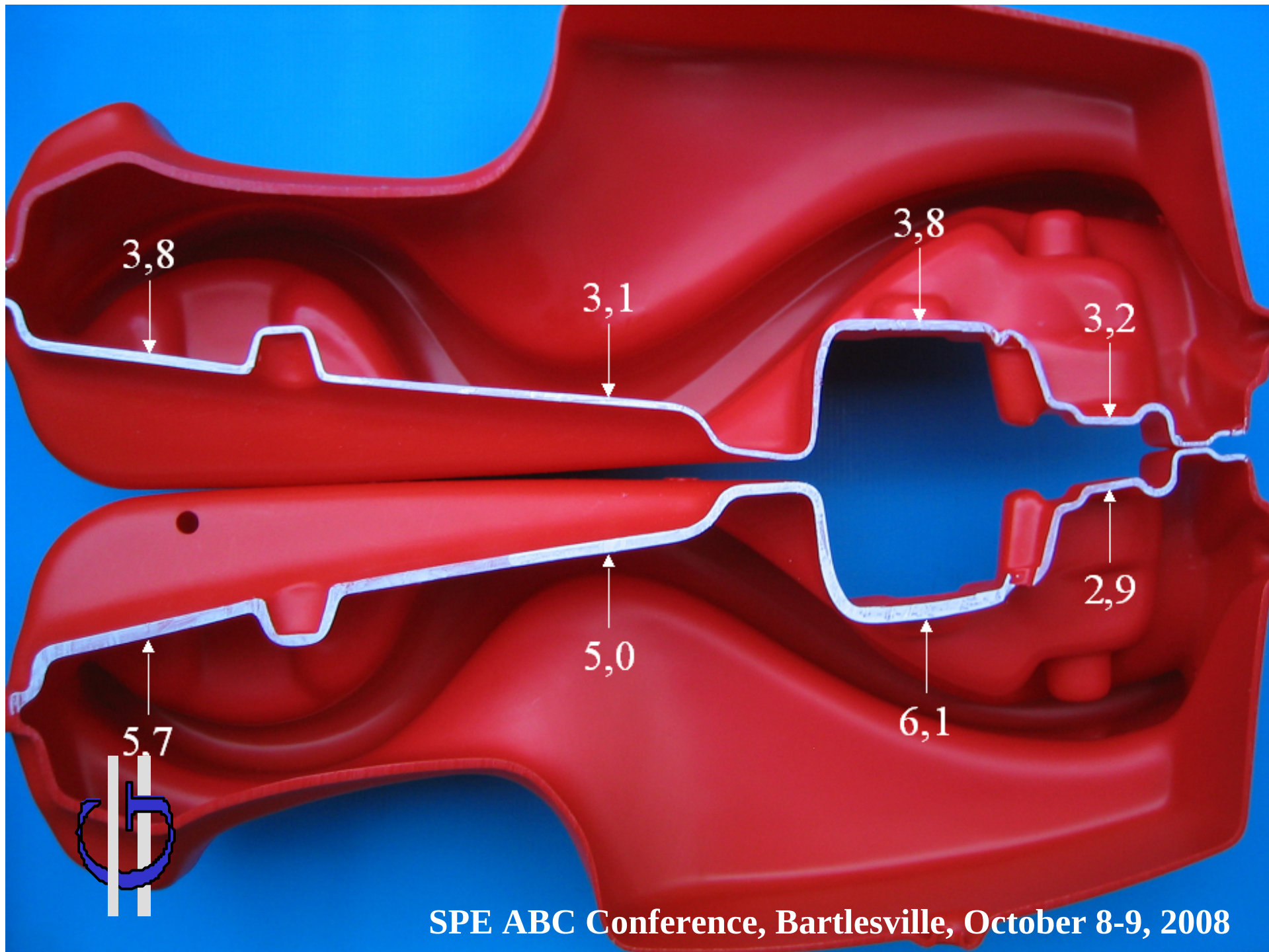
SPH ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008

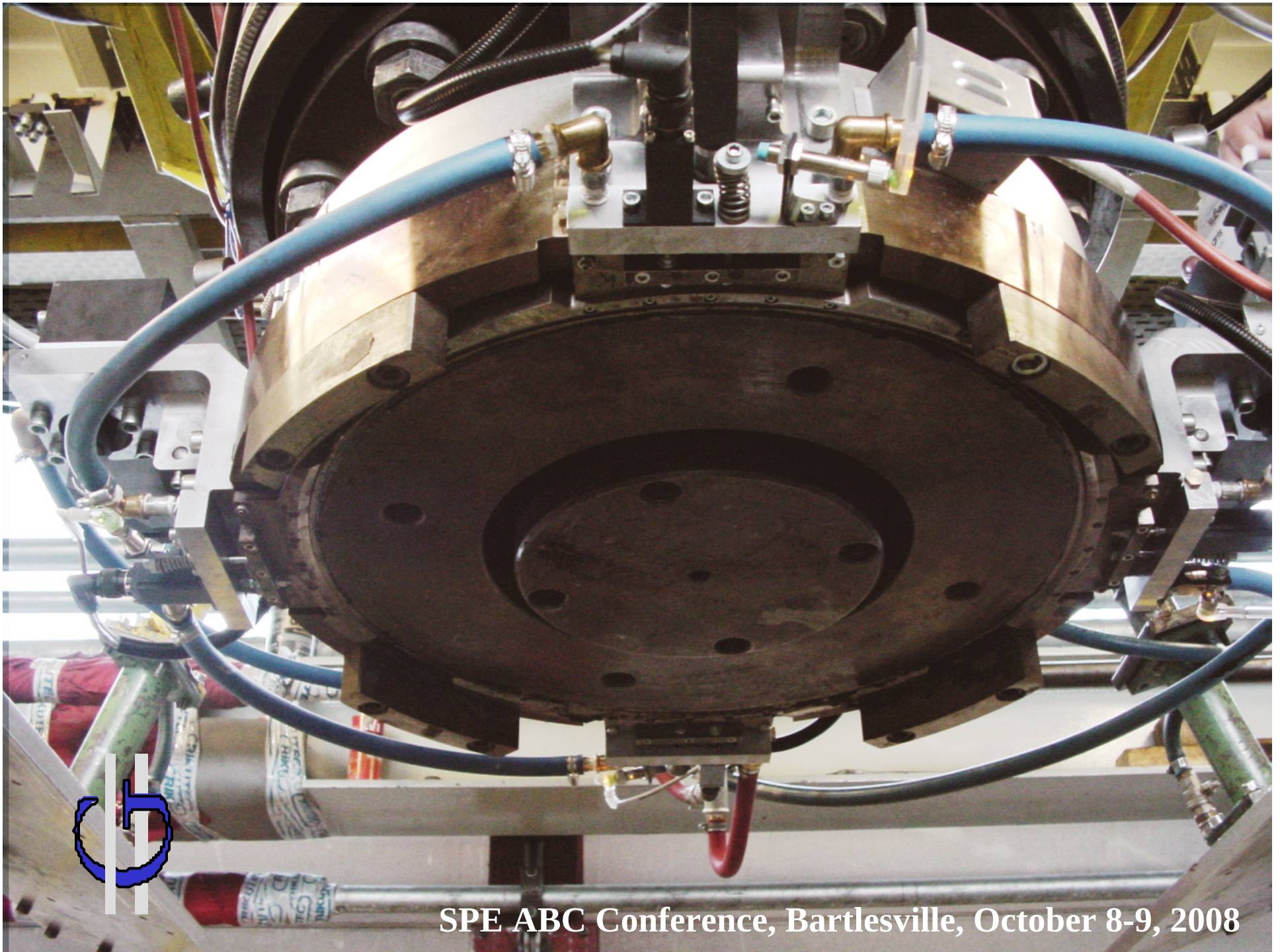
Results

To achieve a control of the radial wall thickness of the parison an existing die could be easily retrofitted with a flex ring sleeve by simply exchanging the outer ring of the die

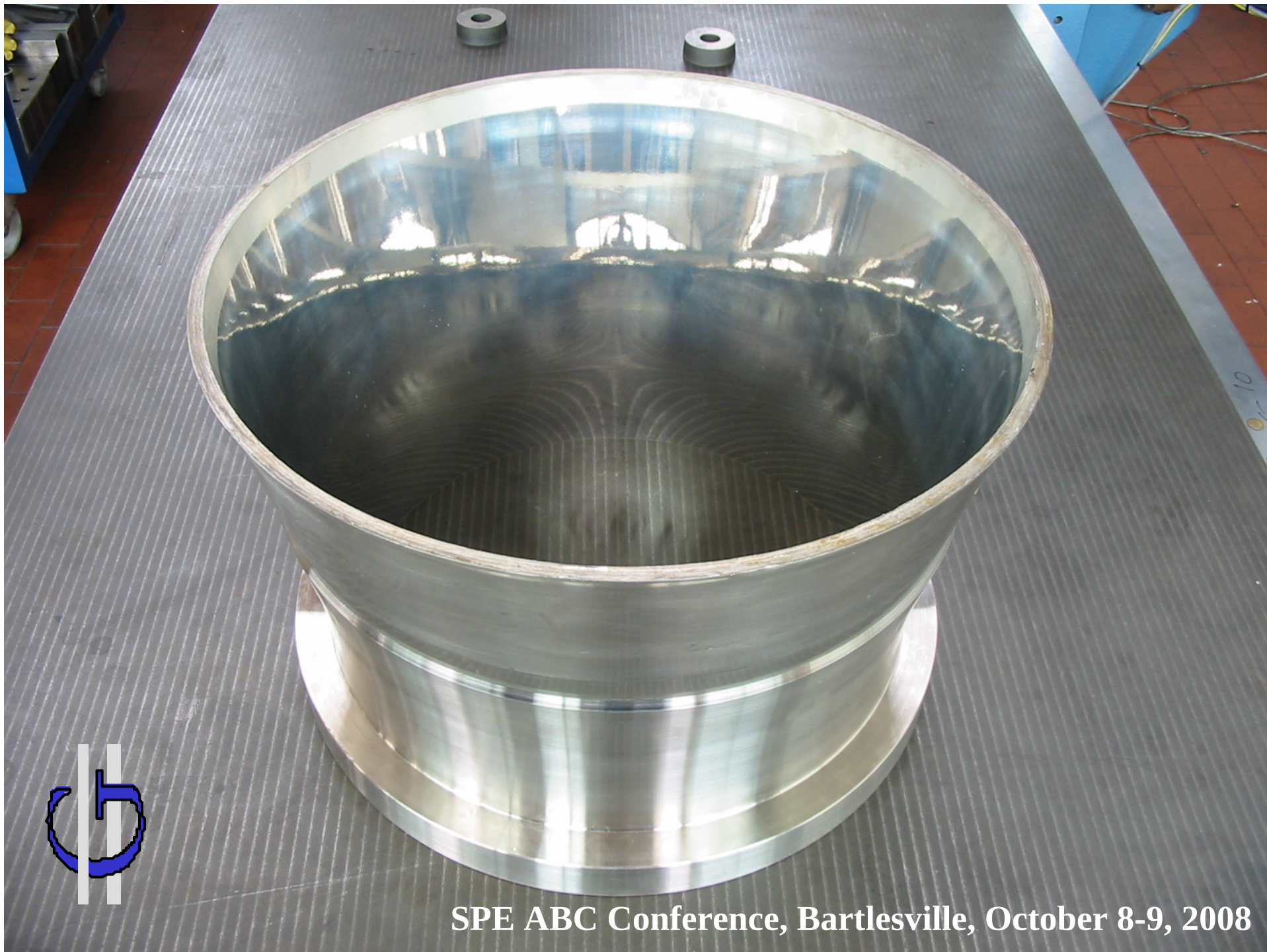
- The investment is small as it is not necessary to build a complicated new die
- Due to the more uniform thickness distribution the quality of the part is improved significantly
- The weight of the part could be reduced by 4 %
- The capacity of the line was increased by reducing the cycle time by 10 %



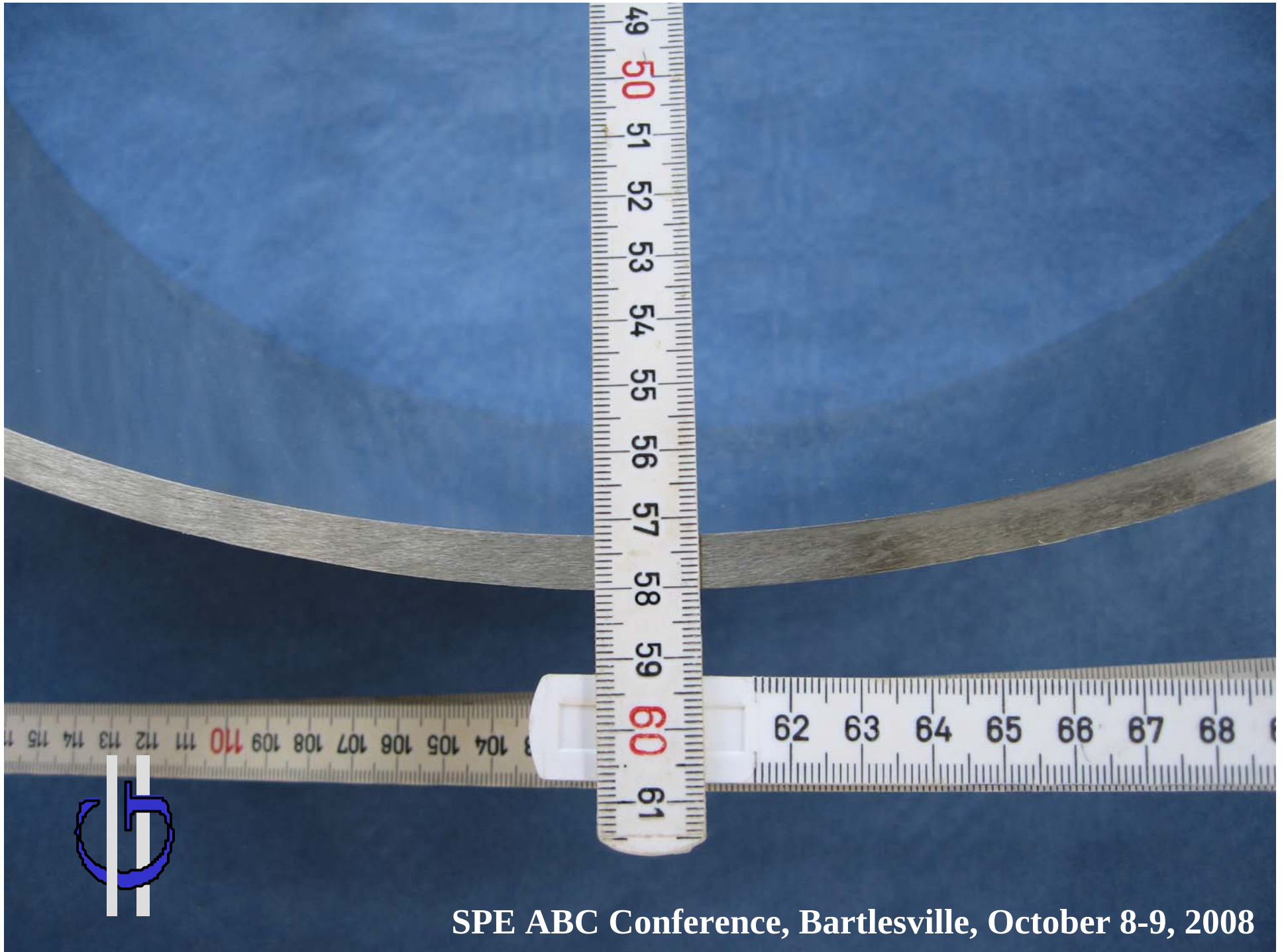
The relation between invest and savings is excellent



SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008



SPE ABC Conference, Bartlesville, October 8-9, 2008

Future prospects

Flex ring technology enables a quick adjustment of the flow channel geometry over the circumference of the die for all die diameters used in extrusion blow molding

In combination with an axial wall thickness adjustment flex ring technology allows precise controlling of the wall thickness distribution of the parison

-  **Radial wall thickness becomes applicable for all die diameters that are used in extrusion blow molding**
-  **It is much easier to manufacture parts with a higher complexity**
-  **Considerable improvements in thickness distribution can be achieved especially for non symmetric parts**
-  **The economics of the blow molding process are improved significantly**



Conclusion

You can achieve remarkable
savings in your company
by technical measures!

You must only have the courage
!!!!!!!!!!!!



SPE ABC Conference, Bartlesville, October 8-9, 2008

Finally.....

(the Germans must always say a final word)

If you understand the
risk

but also see the

opportunities

you can save material by
implementing the flex ring
technology in your production!



Heinz Gross, Bartlesville 2008

SPE ABC Conference, Bartlesville, October 8-9, 2008