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### Abstract

Flexible shapes enable the construction of individually designed, structurally highly efficient structural shells and are therefore becoming more and more important. Due to the individual contours of particular elements, flexible and yet economical manufacturing processes are required. While facade claddings made of flexibly shaped aluminum profiles are already being applied, the use of sandwich elements is, with a few exceptions, limited to straight, flat elements. In the project, a production chain for the manufacture of curved sandwich elements was investigated.

### Project description

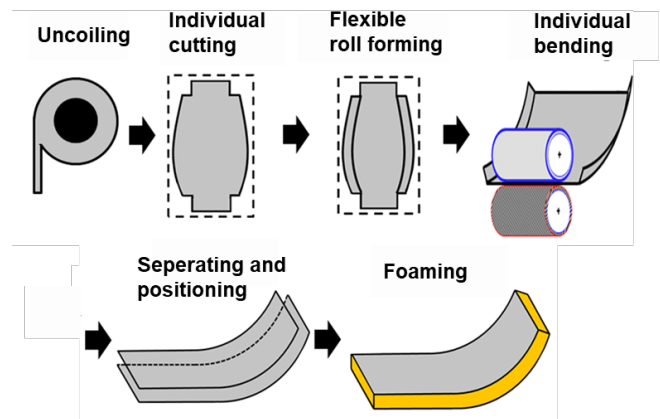
Within this project, a process chain for the production of curved sandwich elements in flexible shapes was investigated on the basis of a dome geometry. The dome consists of uniaxially curved sandwich elements with a variable width along the longitudinal axis. The sandwich element consists of 0.5 mm thick S280GD cover sheets and a rigid polyurethane foam core. First, the sheet is un-wound from the coil and cut to the required cross-sectional contour. Then the joint geometry is created by flexible roll forming and the profile is bent by a roll rounding process. The two curved cover sheets are then placed in a mold for foaming (Fig. 1).

### Results

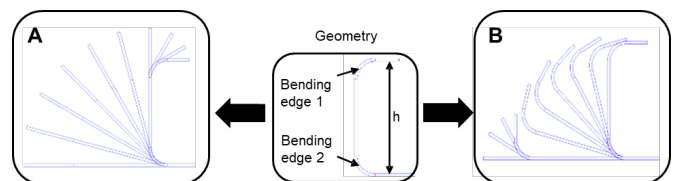
Due to the characteristic stress state during flexible roll forming, longitudinal compressive stresses occur in the flange, which can lead to component failure due to buckling, especially with thin sheet thicknesses. In addition to minimizing flange lengths, the choice of forming strategy for roll formed flanges with multiple bending edges is decisive for the quality of the part. In the example of the joint geometry shown in Figure 2, strategy B represents the more favorable option, since both the flange length of the free flange is kept small and the stiffening effect of the formed-in bending edge 1 counteracts the formation of buckles.

### References:

Moneke, M.; Groche, P.; Schäfer, S.; Reising, J.; Lange, J. & Grimm, S.: Profiliertechnologie für frei geformte Gebäudehüllen in Stahl-Sandwichbauweise. Tagungsband 33. Aachener Stahlkolloquium, 2019  
Groche, P.; Moneke, M.; Wang, T. & Storbeck, M.: Designfreiheit im Bauwesen durch flexible Profiliertechnik. Festschrift Jörg Lange, 2018, 105-112



[1] Process chain for the production of curved sandwich elements



[2] Influence of the shape forming strategy

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## Acknowledgement

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## Funded by

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