The distillation unit operation is the most energy-consuming process in chemical industry. It is responsible for approximately 50% of the total energy consumption of industrial separation processes in the US [1]. Commonly, the distillation is performed in the columns filled with a structured packing. The packing highly increases intricacy of the flow in the column. Consequently, it is nearly impossible to predict hydrodynamic properties of newly designed packings and all new packing designs have to be verified experimentally. The present work is a part of a larger project [2, 3]. The aim of the project is to establish a CFD methodology, usable for evaluation of structured packing performance, to optimize existing packings, and to develop new packing designs. In the present work, we concentrate on modeling the gas flow in a SuperPak family of structured packings. Our approach to model the gas flow in these packings is based on creating a geometry representation that resembles the real packing as much as possible, see Fig. 1.

**SuperPak type packing geometry generation algorithm**

**Require:** Packing geometry parameters: $N_s$, $N_p$, $w_m$, $h_m$, $m_m$, $N_{bc}$, $N_{cold}$, $D_{in}$, $D_{out}$.

1. Make a rectangular $Re$ centered at origin with sides $(N_s + 1) w_m \times (N_p + 1) (l_{out} + m_m)$.
2. for $i = 0$ to $N_p$ do
3. 3. Cut a rectangular hole of dimensions $k \times l_{out}$ into $Re$ centered at $S_i = (-l_{out} + m_m) \mathbf{e}_1 + i (l_{out} + m_m) \mathbf{e}_2$; 0.5;
4. for $i = 0$ to $N_s$ do
5. 5. Create an arc $A_i$ of $l_{out}$ and $h_m$ and with center at $S_i = (-l_{out} + m_m) \mathbf{e}_1 + i (l_{out} + m_m) \mathbf{e}_2$;
6. end for
7. end for
8. Join all arcs $A_i$ and rectangle $Re$ into one sheet $S = \bigcup (A_i) \cup Re$;
9. Make a rectangular cuboid $Rc$ with center at origin and of dimensions $D_{out} = 2 l_{out} \times 2 h_m$.
10. Rotate $S$ by an angle $Rc$, around $z$ axis;
11. Create first sheet of a packing $S_1$ by intersecting sheet $S$ with $Rc$; $S_1 = S \cap Rc$;
12. for $i = 0$ to $N_s$ do
13. 13. Create $S_i$, by copying $S_1$;
14. 14. Translate $S_i$ by $-\mathbf{e}_1 2 l_{out} + 2 h_m \mathbf{e}_1$ on the $z$ axis;
15. 15. if $i$ mod 2 = 1 then
16. 16. Rotate $S_i$ by $\pi$ around the $y$ axis;
17. end if
18. 18. Create a rectangular cuboid, $Rc_i$, centered at origin of dimensions $\sqrt{\frac{D_{out}}{2}} \times \mathbf{e}_1 (N_s + 1) h_m + 2 h_m \mathbf{e}_1 \times (N_p + 1) l_{out} \times 2 h_m$.
19. 19. Cut $S_i$, by making an intersection of $S_i$ with $Rc_i$; $S_i = S_i \cap Rc_i$;
20. end for
21. Create packing $P$ by joining all sheets $S_i$ together: $P = \bigcup (S_i)$;
22. Extrude packing $P$ by $h_{out}$ in the $z$ axis direction;
23. return Geometry representation of the packed bed suitable for the snappyHexMesh utility.

**Figure 2:** Depiction of parameters required to define the SuperPak type packing geometry.

**References**


