

Figure 1

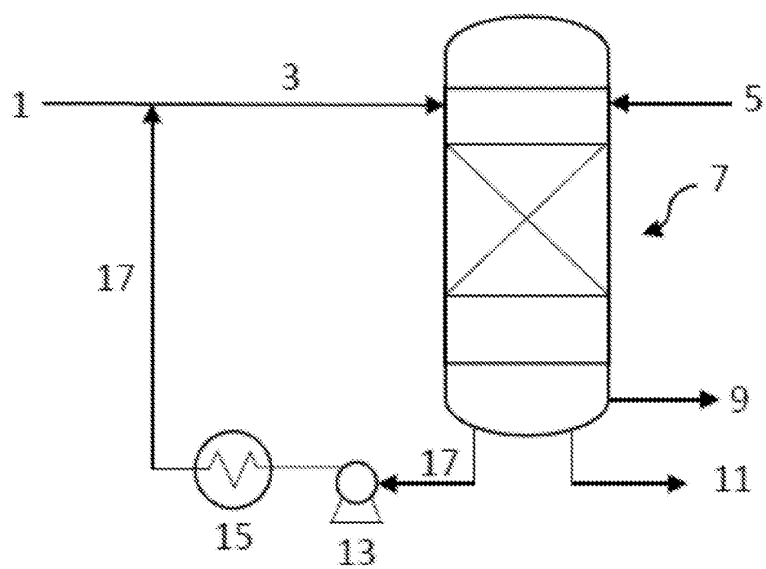


Figure 2

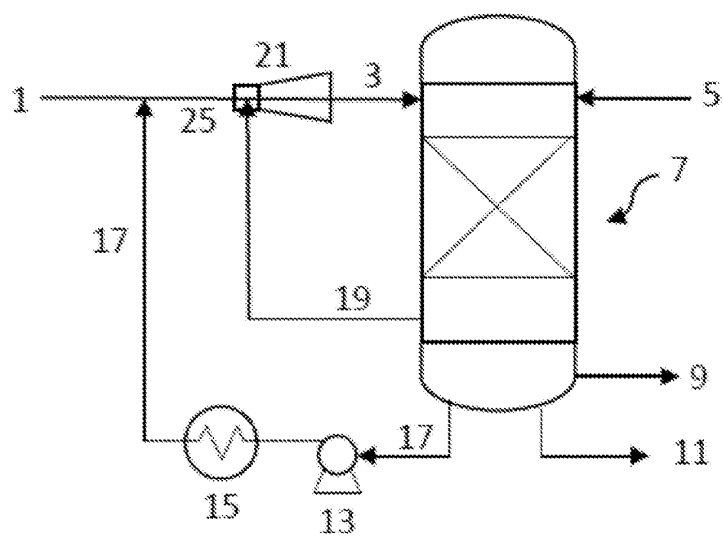


Figure 3

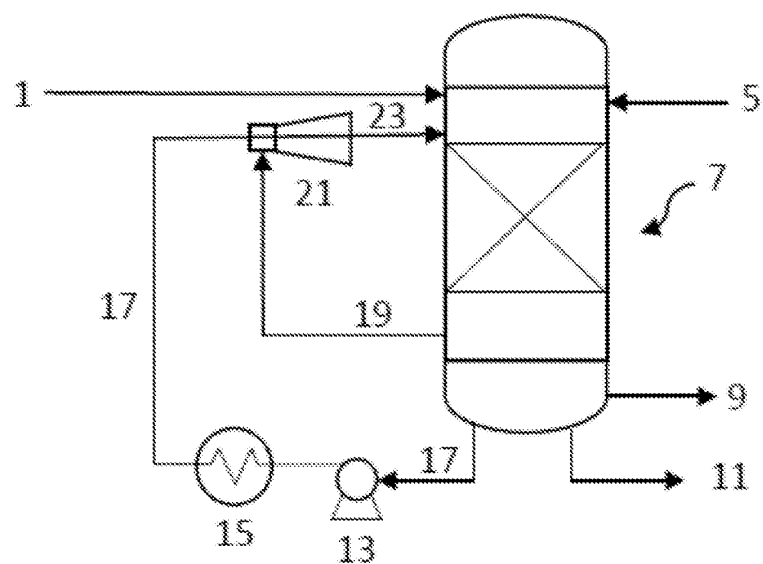


Figure 4

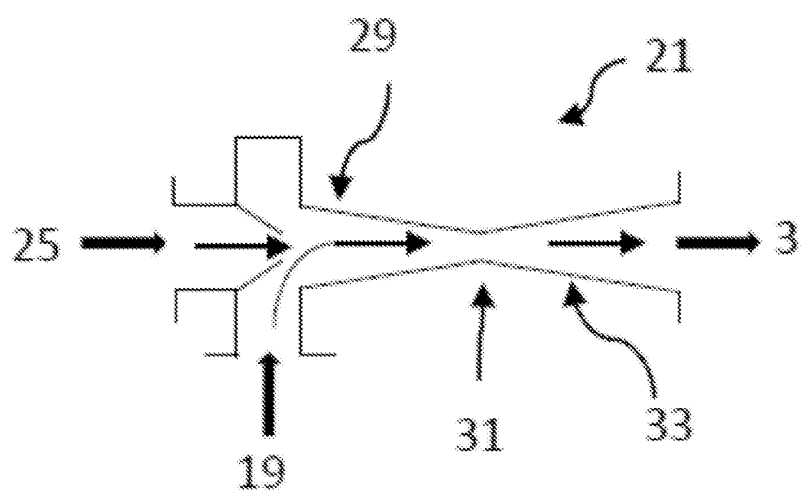


Figure 5

| Conditions                     | Segments of Operation |       |       |       |       |       |  |  |  |  |
|--------------------------------|-----------------------|-------|-------|-------|-------|-------|--|--|--|--|
| Hours Online                   | 86                    | 116   | 131   | 181   | 220   | 252   |  |  |  |  |
| LHSV (h <sup>-1</sup> )        | 1                     | 1     | 1     | 1     | 1     | 1     |  |  |  |  |
| Recycle:Feed                   | 18:1                  | 18:1  | 18:1  | 18:1  | 18:1  | 18:1  |  |  |  |  |
| Temperature (°C)               | 160                   | 160   | 160   | 160   | 160   | 160   |  |  |  |  |
| Pressure (psig)                | 290                   | 290   | 290   | 319   | 319   | 319   |  |  |  |  |
| Vent flow (NLPH)               | 10                    | 1     | 10    | 5     | 4     | 3     |  |  |  |  |
| N2 in inlet gas (NLPH)         | 0                     | 0     | 0     | 3     | 3     | 3     |  |  |  |  |
| N2 in exit gas (mol%)          | n/a                   | n/a   | n/a   | 52.0  | 54.6  | 61.8  |  |  |  |  |
| Liquid:Gas exit volume ratio   | 3.9                   | 39    | 3.9   | -     | -     | -     |  |  |  |  |
| Aldehyde Slip (ppm)            | 3400                  | 4660  | 3640  | 6860  | 6860  | 7553  |  |  |  |  |
| Total By-Prod Make (wt%)       | 7.15                  | 7.46  | 7.34  | 8.24  | 8.52  | 8.35  |  |  |  |  |
| Heavies (wt%)                  | 0.14                  | 0.16  | 0.16  | 0.17  | 0.19  | 0.18  |  |  |  |  |
| Water in Product (wt%)         | 0.65                  | 0.70  | 0.70  | 0.71  | 0.79  | 0.77  |  |  |  |  |
| Conversion (mol%)              | 99.65                 | 99.52 | 99.63 | 99.29 | 99.29 | 99.22 |  |  |  |  |
| Selectivity to Butanols (mol%) | 91.14                 | 90.61 | 90.87 | 89.51 | 89.11 | 88.92 |  |  |  |  |