Data used for the simulation:

Input variables:

|  |  |  |  |
| --- | --- | --- | --- |
| Variable MATLAB | Description | Value | Unit |
| Power | Total power to all electrolyzers | 63000 | Watts |
| q\_lye | Total lye flowrate | N\*83 | gram/sec |
| T\_ini | Temperature of lye at the inlet of electrolyzer | 65 | °C |
| mass\_bt0  (6hr lye volume) | Mass of lye in the buffer tank | 10000 | gram |

Parameters for electrolyzer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable MATLAB | Ulleberg's variable | Unit | Electrolyzer 1 | Electrolyzer 2 | Electrolyzer 3 |
| par.U(i).r1 | r1 |  | 8.05E-05 | 8.05E-05\*0.85 | 8.05E-05\*1.4 |
| par.U(i).r2 | r2 |  | -2.50E-07 | -2.50E-07 | -2.50E-07 |
| par.U(i).s | s |  | 0.185 | 0.185\*0.9 | 0.185\*1.1 |
| par.U(i).t1 | t1 |  | -0.1002 | -0.1002 | -0.1002 |
| par.U(i).t2 | t2 |  | 8.424 | 8.424 | 8.424 |
| par.U(i).t3 | t3 |  | 247.3 | 247.3 | 247.3 |
| par.U(i).f1 | f1 |  | 250 | 250\*0.9 | 250\*1.1 |
| par.U(i).f2 | f2 |  | 0.96 | 0.97 | 0.95 |
| par.TherMo(i).Ct | Ct |  | 625000 | 625000 | 625000 |
| par.TherMo(i).Rt | Rt |  | 0.167 | 0.167 | 0.167 |
| Par.El(i).A | A |  | 0.25 | 0.25 | 0.25 |

Parameters for compressor and gas storage

|  |  |  |  |
| --- | --- | --- | --- |
| Variable MATLAB | Description | Unit | Value |
| VstoH2 | Volume of H2 storage tank | litres | 9500 |
| VstoO2 | Volume of O2 storage tank | litres | 4750 |
| PoutH2 | Gas outlet pressure from H2 storage | bar | 19 |
| PoutO2 | Gas outlet pressure from O2 storage | bar | 19 |
|  | Max design pressure of storage tanks | bar | 30 |
| TstoH2 | Temperature of H2 storage tank | Kelvin | 298 |
| TstoO2 | Temperature of O2 storage tank | Kelvin | 298 |
| Tel | Inlet gas temperature to the compressor | Kelvin | 298 |
| Pel | Inlet gas pressure to the compressor | bar | 3 |
| VdispH2 | Valve displacement of H2 storage tank | | 0.4 |
| VdispO2 | Valve displacement of O2 storage tank | | 0.4 |
| alpha | Compressor efficiency | | 0.63 |
| k | Polytropic efficiency | | 1.62 |

Dependent variables for electrolyzer system:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable MATLAB | Description (at steady state) | Units | Electrolyzer 1 | Electrolyzer 2 | Electrolyzer 3 |
| u\_ini | Cell voltage |  | 1.7473 | 1.7473 | 1.7473 |
| i\_ini | Current |  | 542.0257 | 853.8481 | 321.0532 |
| V\_ini | Electrolyzer voltage |  | 36.6935 | 36.6935 | 36.6935 |
| Pk | Power input to the electrolyzer |  | 1.9889e4 | 3.1331e4 | 1.1781e4 |
| Tk\_ini | Electrolyzer temperature |  | 75.4464 | 82.0449 | 70.7704 |
| nH2el\_ini | Hydrogen flowrate from the electrolyzer |  | 0.0563 | 0.0900 | 0.0326 |
| I\_den | Current density |  | 216.8103 | 341.5392 | 128.4213 |
| SpecEl | Specific electricity |  | 48.6547 | 47.9907 | 49.7222 |

Dependent variables for lye circulation and gas storage

|  |  |  |  |
| --- | --- | --- | --- |
| Variable MATLAB | Description (at steady state) | Units | Value |
| PstoH2 | Pressure of hydrogen storage tank |  | 20 |
| PstoO2 | Pressure of oxygen storage tank |  | 20 |
| Tout | Temperature of lye from all electrolyzers |  | 75.8218 |
| Qcool/Qc | Cooler duty |  | 8.3533e3 |
| Qwater/qH20 | Total water lost during electrolysis |  | 3.2208 |