

|                      |                               |                  |    |
|----------------------|-------------------------------|------------------|----|
| <b>Duty:</b>         | <b>Pregnant Liquor Cooler</b> |                  |    |
| <b>Company:</b>      | Proteus Engineers             |                  |    |
| <b>Project:</b>      | Windimurra Vanadium           | <b>Item No:</b>  |    |
| <b>PHE Type:</b>     | N35                           | <b>Engineer:</b> | NP |
| <b>Quotation No:</b> | <b>Date:</b>                  |                  |    |

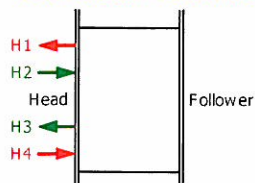
| Process Data              |                      | Hot                  | Cold     |
|---------------------------|----------------------|----------------------|----------|
| Fluid                     |                      | Pregnant_liq(proteus | WATER    |
| Mass Flow Rate            | kg/h                 | 19524                | 50000    |
| Volume Flow Rate          | m <sup>3</sup> /h    | 17.9                 | 50.2     |
| Inlet Temperature         | °C                   | 75.0                 | 30.0     |
| Outlet Temperature, Duty  | °C                   | 36.5                 | 45.0     |
| Pressure Drop, calculated | bar                  | 0.04                 | 0.22     |
| Heat Exchange Rate, Duty  | kW                   | 873                  |          |
| Foul Factor, specified    | °C m <sup>2</sup> /W | 0.000350             | 0.000090 |
| Fluid Volume in PHE       | l                    | 64.6                 | 64.6     |

| Fluid Properties       |          | Hot   | Cold  |
|------------------------|----------|-------|-------|
| Density                | kg/l     | 1.090 | 0.993 |
| Specific Heat Capacity | kJ/kg °C | 4.180 | 4.177 |
| Thermal Conductivity   | W/m °C   | 0.586 | 0.625 |
| Inlet Viscosity        | cP       | 1.60  | 0.80  |
| Outlet Viscosity       | cP       | 3.11  | 0.59  |

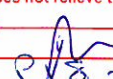
| Plate Heat Exchanger Specifications |                                     |                                                                     |     |                  |
|-------------------------------------|-------------------------------------|---------------------------------------------------------------------|-----|------------------|
| PHE Type                            | N35                                 |                                                                     |     |                  |
| Frame Type / Size                   | MGS-10E/5. Painted, max. 217 plates |                                                                     |     |                  |
| Dimensions (H*W*L)                  | mm                                  | 1525x450x1174                                                       |     |                  |
| Total Number of Plates              | 137                                 |                                                                     |     |                  |
| Total Active Area                   | m <sup>2</sup>                      | 47.25                                                               |     |                  |
| Hot Side Flow Arrangement           | 1*68                                |                                                                     |     |                  |
| Cold Side Flow Arrangement          | 1*68                                |                                                                     |     |                  |
| Plate Material                      | 0.5 mm Ti Gr.1 Paraclip             |                                                                     |     |                  |
| Gasket Material                     | EPDM per. (FDA) Paraclip            |                                                                     |     |                  |
| Hot Side Connection - Inlet         | H4                                  | NPS 3.0 Flange (Studded) Titanium Class 150 (Mates With) ANSI B16.5 |     |                  |
| Hot Side Connection - Outlet        | H1                                  | NPS 3.0 Flange (Studded) Titanium Class 150 (Mates With) ANSI B16.5 |     |                  |
| Cold Side Connection - Inlet        | H2                                  | NPS 3.0 Flange (Studded) Titanium Class 150 (Mates With) ANSI B16.5 |     |                  |
| Cold Side Connection - Outlet       | H3                                  | NPS 3.0 Flange (Studded) Titanium Class 150 (Mates With) ANSI B16.5 |     |                  |
| Design Code                         | PED Marked with CE                  |                                                                     |     |                  |
| Certificate                         |                                     |                                                                     |     |                  |
| Design Temperature                  | °C                                  | Max.                                                                | 100 | Min. 0           |
| Design Pressure                     | bar                                 | 5.0                                                                 |     |                  |
| Test Pressure                       | bar                                 | Balanced                                                            | 7.8 | Differential 6.0 |
| Mass                                | kg                                  | Flooded                                                             | 590 | Empty 456        |
| Approx. Shipping Mass & Volume      | No Packing                          |                                                                     | kg  | m <sup>3</sup>   |

| Accessories |  |  |  |  |
|-------------|--|--|--|--|
|             |  |  |  |  |

## Connection Placement



## Remarks

|                                                                                              |                   |          |                 |                  |               |  |  |  |  |
|----------------------------------------------------------------------------------------------|-------------------|----------|-----------------|------------------|---------------|--|--|--|--|
|           |                   |          |                 |                  |               |  |  |  |  |
| VENDOR DOCUMENT REVIEW                                                                       |                   |          |                 |                  |               |  |  |  |  |
| NOT APPROVED                                                                                 | APPROVED AS NOTED | APPROVED | CERTIFIED FINAL | INFORMATION ONLY |               |  |  |  |  |
| NA                                                                                           | AN                | A        | CF              | IN               |               |  |  |  |  |
| Approval does not relieve the Vendor/Contractor of their contractual obligations             |                   |          |                 |                  |               |  |  |  |  |
| SIGNED:  |                   |          |                 |                  | DATE: 24/5/18 |  |  |  |  |
| DOC NO: P/8-006                                                                              |                   |          |                 |                  | REV: 1        |  |  |  |  |