**Details of data analysis**

## Custom response surface design of experiment

Responses studied by the custom response surface analysis were *E. coli*, coliforms, enterococci and methane. Factors are presented in Table A1 and Table A2. Models incorporated full quadratic terms. The experimental design had no blocks and the total number of runs was 180.

Table A.1. Continuous factors and their uncoded levels for the custom response surface design. Temp, OL and time stands for temperature, organic loading and retention time.

|  |  |  |
| --- | --- | --- |
| **name** | **low** | **high** |
| temp | 19 | 55 |
| OL | 0.5 | 3.5 |
| time | 3 | 9 |

Table A.2. Categorical factor and related uncoded levels for the custom response surface design. 1S:3FW stands for 1 part slurry to 3 parts food processing waste; 2S:1FW for 2 parts slurry to 1 part food processing waste; and 3S:1FW for 3 parts slurry to 1 part food processing waste.

|  |  |
| --- | --- |
| name | levels |
| recipe | "1S:3FW"  "2S:1FW"  "3S:1FW" |

## Response Surface Regression: Coliforms versus Temp, OL, Time, Recipe

Table B.1. Analysis of variance

|  |  |  |
| --- | --- | --- |
| Source | DF | P-Value |
| Model | 17 | 0 |
| Linear | 5 | 0 |
| Temp | 1 | 0 |
| OL | 1 | 0 |
| Time | 1 | 0 |
| Recipe | 2 | 0 |
| Square | 3 | 0 |
| Temp\*Temp | 1 | 0 |
| OL\*OL | 1 | 0.904 |
| Time\*Time | 1 | 0.352 |
| 2-Way Interaction | 9 | 0.121 |
| Temp\*OL | 1 | 0.07 |
| Temp\*Time | 1 | 0.558 |
| Temp\*Recipe | 2 | 0.038 |
| OL\*Time | 1 | 0.065 |
| OL\*Recipe | 2 | 0.872 |
| Time\*Recipe | 2 | 0.874 |
| Error | 162 |  |
| Lack-of-Fit | 21 | 0 |
| Pure Error | 141 |  |
| Total | 179 |  |

Table B.2. Model summary

|  |  |  |  |
| --- | --- | --- | --- |
| S | R-sq | R-sq(adj) | R-sq(pred) |
| 0.827033 | 83.87% | 82.17% | 79.9% |

Table B.3. Coded coefficients

|  |  |  |
| --- | --- | --- |
| Term | Coef | P-Value |
| Constant | 4.65 | 0 |
| Temp | -2.0607 | 0 |
| OL | 0.4601 | 0 |
| Time | -0.4842 | 0 |
| Recipe |  |  |
| 2S:1FW | -0.4217 | 0 |
| 3S:1FW | 0.0082 | 0.925 |
| Temp\*Temp | -1.424 | 0 |
| OL\*OL | 0.015 | 0.904 |
| Time\*Time | -0.116 | 0.352 |
| Temp\*OL | -0.217 | 0.07 |
| Temp\*Time | -0.07 | 0.558 |
| Temp\*Recipe | |  |
| 2S:1FW | 0.291 | 0.016 |
| 3S:1FW | -0.056 | 0.638 |
| OL\*Time | -0.222 | 0.065 |
| OL\*Recipe | |  |
| 2S:1FW | -0.061 | 0.608 |
| 3S:1FW | 0.021 | 0.862 |
| Time\*Recipe | |  |
| 2S:1FW | 0.061 | 0.607 |
| 3S:1FW | -0.023 | 0.846 |

Table B.4. Regression equation for each feedstock recipe in uncoded units

|  |  |
| --- | --- |
| **Recipe** | **Equation** |
| 2S:1FW | Coliforms = 0.25 + 0.2509 Temp + 0.833 OL + 0.160 Time - 0.004396 Temp\*Temp  + 0.0067 OL\*OL - 0.0129 Time\*Time - 0.00805 Temp\*OL - 0.00130 Temp\*Time  - 0.0494 OL\*Time |
| 3S:1FW | Coliforms = 1.45 + 0.2316 Temp + 0.888 OL + 0.132 Time - 0.004396 Temp\*Temp  + 0.0067 OL\*OL - 0.0129 Time\*Time - 0.00805 Temp\*OL - 0.00130 Temp\*Time  - 0.0494 OL\*Time |
| 1S:3FW | Coliforms = 2.23 + 0.2217 Temp + 0.901 OL + 0.127 Time - 0.004396 Temp\*Temp  + 0.0067 OL\*OL - 0.0129 Time\*Time - 0.00805 Temp\*OL - 0.00130 Temp\*Time  - 0.0494 OL\*Time |

## Response Surface Regression: *E. coli* versus Temp, OL, Time, Recipe

Table C.1. Analysis of variance

|  |  |  |
| --- | --- | --- |
| Source | DF | P-Value |
| Model | 17 | 0 |
| Linear | 5 | 0 |
| Temp | 1 | 0 |
| OL | 1 | 0 |
| Time | 1 | 0 |
| Recipe | 2 | 0 |
| Square | 3 | 0 |
| Temp\*Temp | 1 | 0 |
| OL\*OL | 1 | 0.861 |
| Time\*Time | 1 | 0.333 |
| 2-Way-Interaction | 9 | 0.037 |
| Temp\*OL | 1 | 0.002 |
| Temp\*Time | 1 | 0.918 |
| Temp\*Recipe | 2 | 0.087 |
| OL\*Time | 1 | 0.131 |
| OL\*Recipe | 2 | 0.752 |
| Time\*Recipe | 2 | 0.63 |
| Error | 162 |  |
| Lack-of-Fit | 21 | 0 |
| Pure-Error | 141 |  |
| Total | 179 |  |

Table C.2. Model summary

|  |  |  |  |
| --- | --- | --- | --- |
| S | R-sq | R-sq(adj) | R-sq(pred) |
| 0.798127 | 84.0% | 82.3% | 80.2% |

Table C.3. Coded coefficients

|  |  |  |
| --- | --- | --- |
| Term | Coef | P-Value |
| Constant | 4.574 | 0 |
| Temp | -1.918 | 0 |
| OL | 0.4816 | 0 |
| Time | -0.5467 | 0 |
| Recipe |  |  |
| 2S:1FW | -0.3619 | 0 |
| 3S:1FW | -0.0432 | 0.609 |
| Temp\*Temp | -1.556 | 0 |
| OL\*OL | -0.021 | 0.861 |
| Time\*Time | -0.117 | 0.333 |
| Temp\*OL | -0.359 | 0.002 |
| Temp\*Time | -0.012 | 0.918 |
| Temp\*Recipe | |  |
| 2S:1FW | 0.248 | 0.033 |
| 3S:1FW | -0.068 | 0.556 |
| OL\*Time | -0.175 | 0.131 |
| OL\*Recipe | |  |
| 2S:1FW | -0.058 | 0.618 |
| 3S:1FW | -0.028 | 0.811 |
| Time\*Recipe | |  |
| 2S:1FW | 0.111 | 0.337 |
| 3S:1FW | -0.058 | 0.615 |

Table C.4. Regression equation for each feedstock recipe in uncoded units

|  |  |
| --- | --- |
| **Recipe** | **Equation** |
| 2S:1FW | Ecoli = -0.63 + 0.2904 Temp + 1.045 OL + 0.096 Time - 0.004801 Temp\*Temp  - 0.0094 OL\*OL - 0.0129 Time\*Time - 0.01330 Temp\*OL - 0.00022 Temp\*Time  - 0.0388 OL\*Time |
| 3S:1FW | Ecoli = 0.64 + 0.2729 Temp + 1.065 OL + 0.040 Time - 0.004801 Temp\*Temp  - 0.0094 OL\*OL - 0.0129 Time\*Time - 0.01330 Temp\*OL - 0.00022 Temp\*Time  - 0.0388 OL\*Time |
| 1S:3FW | Ecoli = 1.16 + 0.2666 Temp + 1.140 OL + 0.041 Time - 0.004801 Temp\*Temp  - 0.0094 OL\*OL - 0.0129 Time\*Time - 0.01330 Temp\*OL - 0.00022 Temp\*Time  - 0.0388 OL\*Time |

## Response Surface Regression: Enterococci versus Temp, OL, Time, Recipe

Table D.1. Analysis of variance

|  |  |  |
| --- | --- | --- |
| Source | DF | P-Value |
| Model | 17 | 0 |
| Linear | 5 | 0 |
| Temp | 1 | 0 |
| OL | 1 | 0 |
| Time | 1 | 0.695 |
| Recipe | 2 | 0 |
| Square | 3 | 0 |
| Temp\*Temp | 1 | 0 |
| OL\*OL | 1 | 0 |
| Time\*Time | 1 | 0.994 |
| 2-Way-Interaction | 9 | 0.011 |
| Temp\*OL | 1 | 0.716 |
| Temp\*Time | 1 | 0.004 |
| Temp\*Recipe | 2 | 0.019 |
| OL\*Time | 1 | 0.41 |
| OL\*Recipe | 2 | 0.203 |
| Time\*Recipe | 2 | 0.455 |
| Error | 162 |  |
| Lack-of-Fit | 21 | 0 |
| Pure-Error | 141 |  |
| Total | 179 |  |

Table D.2. Model summary

|  |  |  |  |
| --- | --- | --- | --- |
| S | R-sq | R-sq(adj) | R-sq(pred) |
| 0.635807 | 86.8% | 85.4% | 83.5% |

Table D.3. Coded coefficients

|  |  |  |  |
| --- | --- | --- | --- |
| Term | | Coef | P-Value |
| Constant | | 5.676 | 0 |
| Temp | | -1.8134 | 0 |
| OL | | 0.296 | 0 |
| Time | | -0.0255 | 0.695 |
| Recipe | |  |  |
| 2S:1FW | | -0.3993 | 0 |
| 3S:1FW | | 0.2194 | 0.001 |
| Temp\*Temp | | -1.3168 | 0 |
| OL\*OL | | -0.4455 | 0 |
| Time\*Time | | 0.0007 | 0.994 |
| Temp\*OL | | 0.0335 | 0.716 |
| Temp\*Time | | -0.2702 | 0.004 |
| Temp\*Recipe | | |  |
| 2S:1FW | 0.2363 | | 0.011 |
| 3S:1FW | -0.0225 | | 0.806 |
| OL\*Time | 0.0758 | | 0.41 |
| OL\*Recipe | | |  |
| 2S:1FW | -0.1439 | | 0.119 |
| 3S:1FW | 0.1414 | | 0.125 |
| Time\*Recipe | | |  |
| 2S:1FW | -0.1039 | | 0.259 |
| 3S:1FW | 0.0953 | | 0.3 |

Table D.4. Regression equation for each feedstock recipe in uncoded units

|  |  |
| --- | --- |
| **Recipe** | **Equation** |
| 2S:1FW | Enterococci = 1.405 + 0.2407 Temp + 0.747 OL + 0.107 Time - 0.004064 Temp\*Temp  - 0.1980 OL\*OL + 0.0001 Time\*Time + 0.00124 Temp\*OL - 0.00500 Temp\*Time  + 0.0168 OL\*Time |
| 3S:1FW | Enterococci = 1.776 + 0.2263 Temp + 0.937 OL + 0.174 Time - 0.004064 Temp\*Temp  - 0.1980 OL\*OL + 0.0001 Time\*Time + 0.00124 Temp\*OL - 0.00500 Temp\*Time  + 0.0168 OL\*Time |
| 1S:3FW | Enterococci = 2.489 + 0.2157 Temp + 0.844 OL + 0.145 Time - 0.004064 Temp\*Temp  - 0.1980 OL\*OL + 0.0001 Time\*Time + 0.00124 Temp\*OL - 0.00500 Temp\*Time  + 0.0168 OL\*Time |

## Response Surface Regression: Methane versus Temp, OL, Time, Recipe

Table E.1. Analysis of variance

|  |  |  |
| --- | --- | --- |
| Source | DF | P-Value |
| Model | 17 | 0 |
| Linear | 5 | 0 |
| Temp | 1 | 0.1 |
| OL | 1 | 0 |
| Time | 1 | 0 |
| Recipe | 2 | 0.099 |
| Square | 3 | 0 |
| Temp\*Temp | 1 | 0 |
| OL\*OL | 1 | 0.026 |
| Time\*Time | 1 | 0.038 |
| 2-Way-Interaction | 9 | 0 |
| Temp\*OL | 1 | 0.894 |
| Temp\*Time | 1 | 0.639 |
| Temp\*Recipe | 2 | 0.771 |
| OL\*Time | 1 | 0 |
| OL\*Recipe | 2 | 0.07 |
| Time\*Recipe | 2 | 0.212 |
| Error | 162 |  |
| Lack-of-Fit | 21 | 0 |
| Pure-Error | 141 |  |
| Total | 179 |  |

Table E.2. Model summary

|  |  |  |  |
| --- | --- | --- | --- |
| S | R-sq | R-sq(adj) | R-sq(pred) |
| 16.8947 | 87.8% | 86.6% | 84.7% |

Table E.3. Coded coefficients

|  |  |  |  |
| --- | --- | --- | --- |
| Term | | Coef | P-Value |
| Constant | | 92.38 | 0 |
| Temp | | -2.85 | 0.1 |
| OL | | 16.19 | 0 |
| Time | | 23.06 | 0 |
| Recipe | |  |  |
| 2S:1FW | | -2.46 | 0.17 |
| 3S:1FW | | -1.35 | 0.45 |
| Temp\*Temp | | -74.04 | 0 |
| OL\*OL | | -5.72 | 0.026 |
| Time\*Time | | -5.3 | 0.038 |
| Temp\*OL | | -0.32 | 0.894 |
| Temp\*Time | | -1.15 | 0.639 |
| Temp\*Recipe | | |  |
| 2S:1FW | 1.75 | | 0.473 |
| 3S:1FW | -0.99 | | 0.685 |
| OL\*Time | 14.58 | | 0 |
| OL\*Recipe | | |  |
| 2S:1FW | -5.67 | | 0.021 |
| 3S:1FW | 2.98 | | 0.224 |
| Time\*Recipe | | |  |
| 2S:1FW | 4.23 | | 0.085 |
| 3S:1FW | -2.86 | | 0.243 |

Table E.4. Regression equation for each feedstock recipe in uncoded units

|  |  |
| --- | --- |
| **Recipe** | **Equation** |
| 2S:1FW | Methane = -287.3 + 17.000 Temp - 1.82 OL + 10.47 Time - 0.22851 Temp\*Temp  - 2.54 OL\*OL - 0.589 Time\*Time - 0.0120 Temp\*OL - 0.0212 Temp\*Time  + 3.240 OL\*Time |
| 3S:1FW | Methane = -277.9 + 16.847 Temp + 3.95 OL + 8.11 Time - 0.22851 Temp\*Temp - 2.54 OL\*OL  - 0.589 Time\*Time - 0.0120 Temp\*OL - 0.0212 Temp\*Time + 3.240 OL\*Time |
| 1S:3FW | Methane = -275.8 + 16.860 Temp + 3.76 OL + 8.60 Time - 0.22851 Temp\*Temp - 2.54 OL\*OL  - 0.589 Time\*Time - 0.0120 Temp\*OL - 0.0212 Temp\*Time + 3.240 OL\*Time |