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Stochastic evolutionary-based optimization for rapid diagnosis and energy-saving in pilot- and full-scale Carrousel oxidation ditches

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Supporting Information

Real-time simulation and stochastic evolutionary-based optimization in pilot-scale and full-scale Carrousel oxidation ditches

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Fig. S1 Correlation between averaged liquid velocity and standard deviation of MLSS concentration over a range of operational modes in a pilot-scale oxidation ditch.
Fig. S2 Energy consumption of: (a) aeration device, (b) surface impeller, and (c) submerged stirrer over the operational range of the pilot-scale OD.
Fig. S3 Effect of (a) population size and (b) number of smart individuals on the optimization results obtained by the AGA module for the pilot-scale OD.
Fig. S4 Sketch indicating sampling locations in the full-scale oxidation ditch at Ping Dngshan, Henan Province, China (Unit: m).
Fig. S5 Predicted and measured transverse profiles under existing operating conditions of horizontal liquid speed across: (a) Section 1-1, (b) Section 2-2, and (c) Section 3-3 of the full-scale OD at Ping Dingshan, Henan Province, China.
Fig. S6 Predicted horizontal flow speeds in four horizontal slices through the depth: (a) surface layer, (b) top layer, (c) middle layer, and (d) bottom layer of the full-scale OD at Ping Dingshan, Henan Province, China.
Fig. S7 Simulated and measured dissolved oxygen concentration distributions at: (a) Section 2-2, and (b) Section 3-3 of the full-scale OD at Ping Dingshan, Henan Province, China.
Fig. S8 Correlation between average liquid velocity and standard deviation of MLSS concentration under different operation modes for the full-scale oxidation ditch at Ping Dingshan, Henan Province, China.
### Tale S1 Characteristics of influent and effluent water quality of full-scale oxidation ditch at Pingdingshan, China, under existing operating condition.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>COD</th>
<th>BOD$_5$</th>
<th>TN</th>
<th>Ammonia nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influent (mg/L)</td>
<td>333.1</td>
<td>92.2</td>
<td>35.1</td>
<td>24.7</td>
</tr>
<tr>
<td>Effluent (mg/L)</td>
<td>26.1</td>
<td>8.2</td>
<td>19.7</td>
<td>2.0</td>
</tr>
</tbody>
</table>
Table S2 Measured and simulated effluent water quality parameters under existing operating condition for the full-scale oxidation ditch at Ping Dingshan, China.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Measured</th>
<th>Calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD (mg/L)</td>
<td>26.1</td>
<td>28.5</td>
</tr>
<tr>
<td>Ammonia nitrogen (mg/L)</td>
<td>2.0</td>
<td>2.3</td>
</tr>
<tr>
<td>TN (mg/L)</td>
<td>19.7</td>
<td>18.0</td>
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</table>