

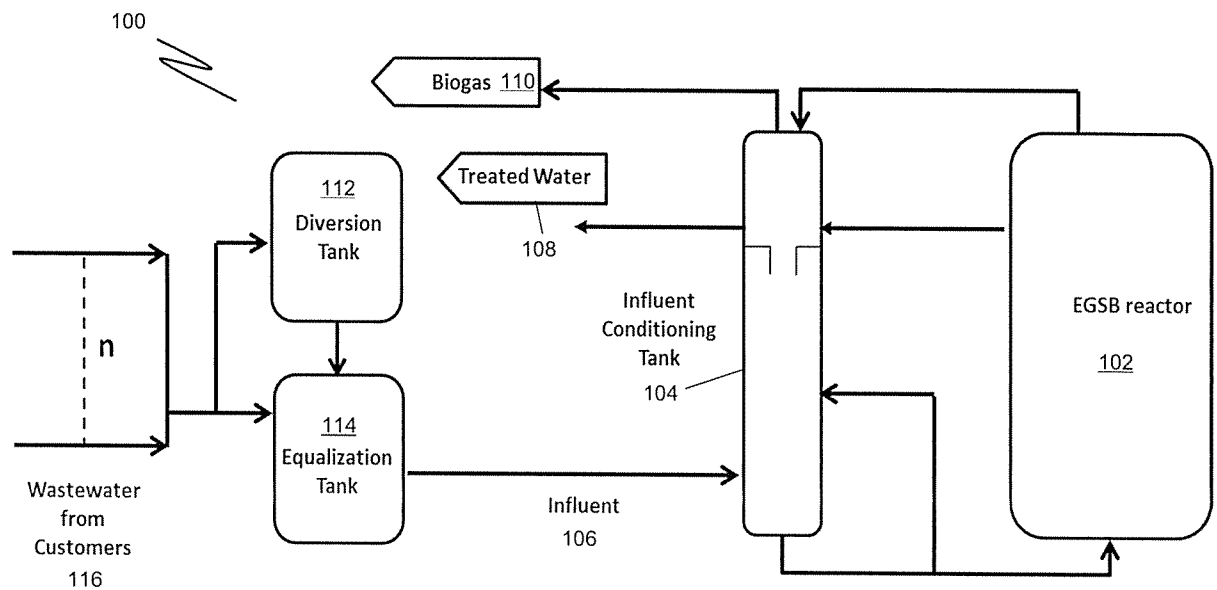


Fig. 1

200

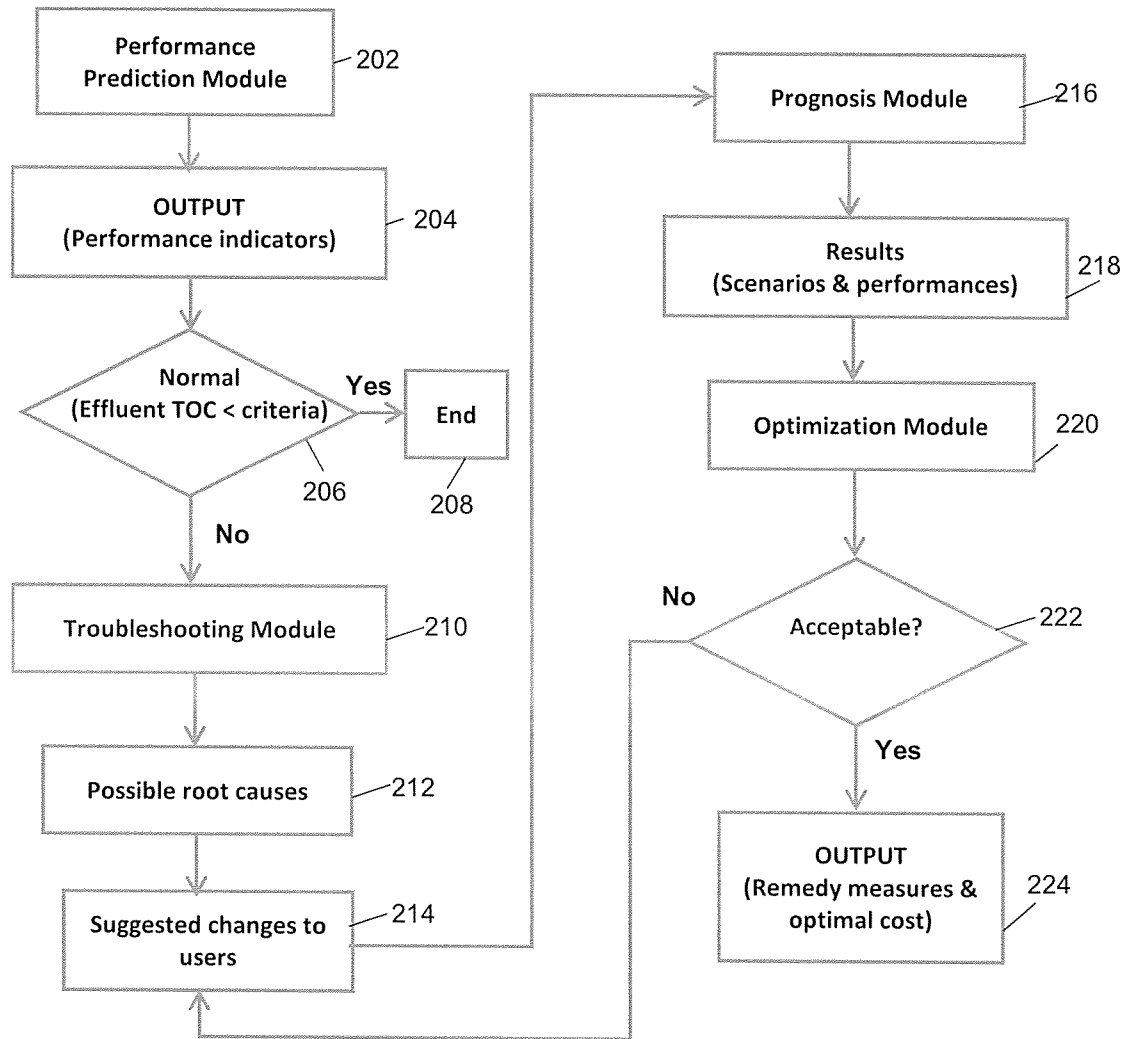


Fig. 2

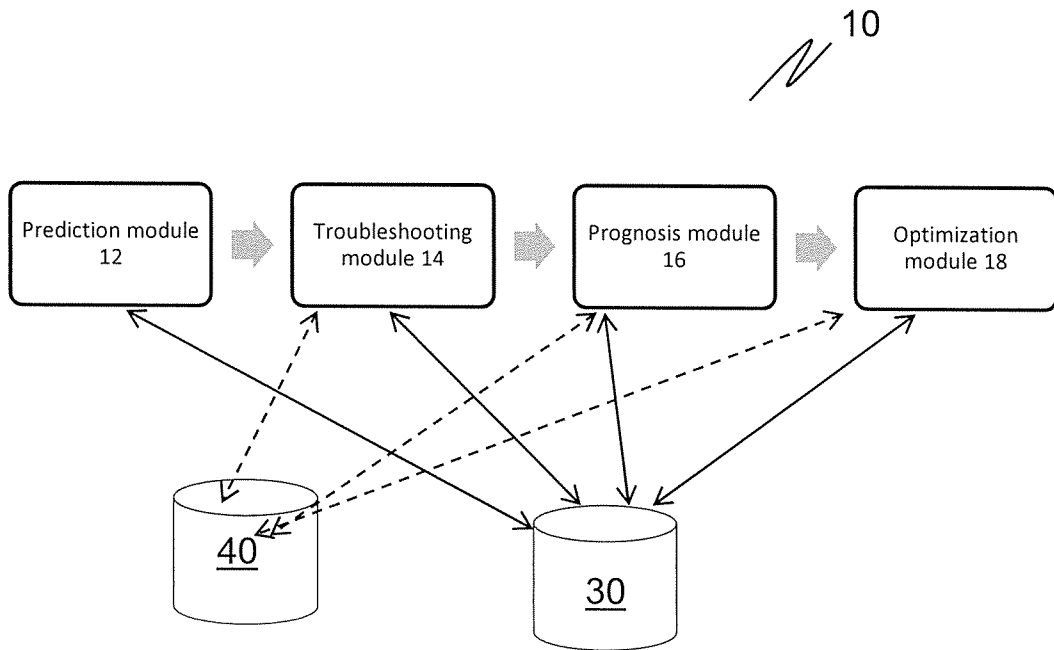


Fig. 3

4/17

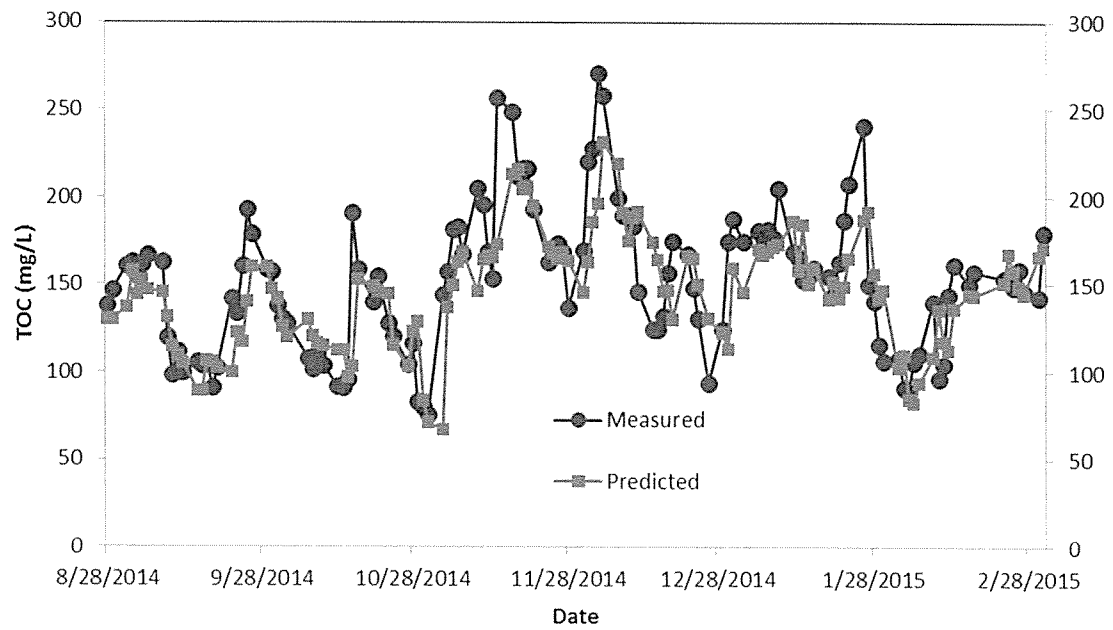


Fig. 4

|      |                              |           |              |               |
|------|------------------------------|-----------|--------------|---------------|
| Home | Prediction & Troubleshooting | Prognosis | Optimization | Data Analysis |
|------|------------------------------|-----------|--------------|---------------|

Prediction performance indicator  
(Please key in desired effluent TOC value)

No key in is required to use the default value (400)

mg/L

Fig. 5

Troubleshooting Module

500

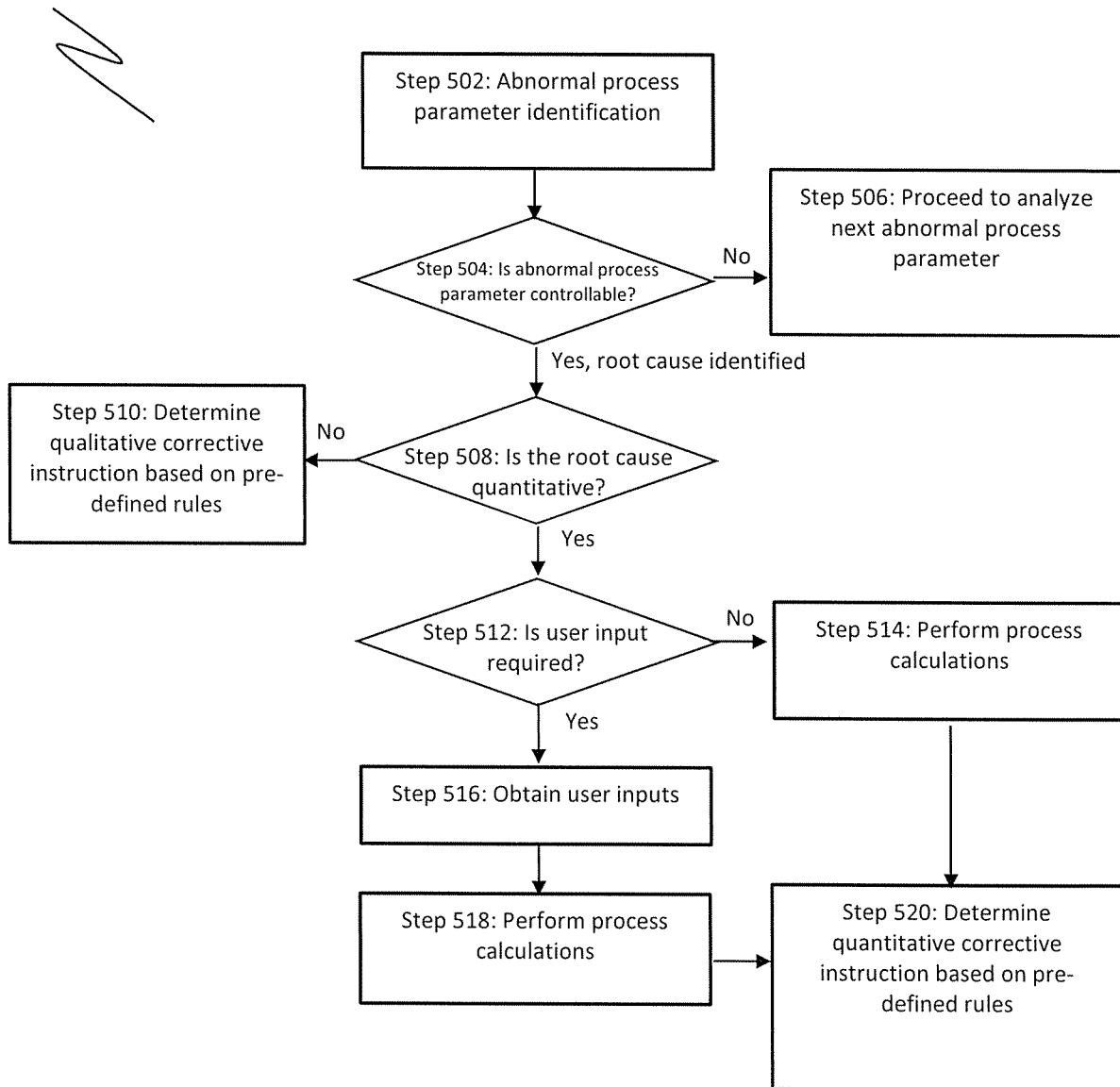


Fig. 6

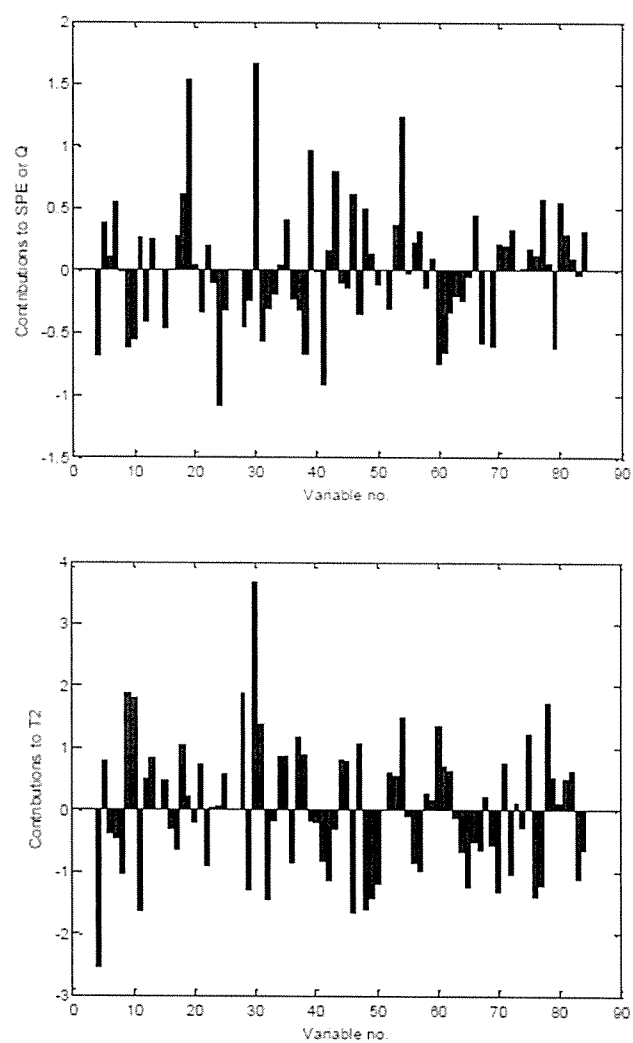


Fig. 7

## Template for calculation 1

### Calculation Background

Triggered by high TOC/Phenol content in customer wastewater, recommendation is to divert wastewater to diversion tank TK001. Based on different process conditions, the recommendation provided to the user will differ.

### Nomenclature

|                                                                       |                                                                                |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------|
| DF: Total diversion flow to Diversion Tank (m <sup>3</sup> /hr)       | LTK001: Diversion Tank level in percentage (%)                                 |
| DVTVol: Equalization Tank Capacity (m <sup>3</sup> )                  | EQTMax: Maximum allowed level in Equalization Tank in percentage (%)           |
| FTK001: Flow from Diversion Tank to Equalization (m <sup>3</sup> /hr) | MaxVTK001: maximum volume available for wastewater diversion (m <sup>3</sup> ) |
| MaxTTK001: maximum time available for wastewater diversion (hr)       |                                                                                |

### Calculation

Function [MaxVTK001, MaxTTK001] = maxTK001cal (LTK001, FTK001, DF)

$$\text{MaxVTK001} = \frac{(EQT_{\text{Max}} - LTK001)}{100} \times DVTVol$$

$$\text{MaxTTK001} = \frac{\frac{(EQT_{\text{Max}} - LTK001)}{100} \times DVTVol}{(DF - FTK001)}$$

Fig. 8a

**Scenario testing for calculation 1:**

| Scenario | Conditions                         | Recommendation                                                                                                                                                                                                                                            |
|----------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | LTK001 ≥ 80%:                      | Diversion tank level is at <b>LTK001</b> %, reduce current level before diverting additional wastewater to the tank.                                                                                                                                      |
| 2        | LTK001 < 80%,<br>DF > FTK001       | Divert the selected wastewater stream(s) to TK-001. Current level in TK-001 is <b>LTK001</b> %. Based on current conditions, maximum TK-001 inventory available is <b>MaxVTK001</b> m <sup>3</sup> . TK-001 level will reach 80% in <b>MaxTTK001</b> hrs. |
| 3        | LTK001 < 80%<br>AND<br>DF ≤ FTK001 | Based on current conditions, TK-001 will not reach 80% level since the transfer rate of wastewater from TK-001 to T-01 is greater than or equal to the flowrate of TK-001 incoming wastewater.                                                            |

Fig. 8b

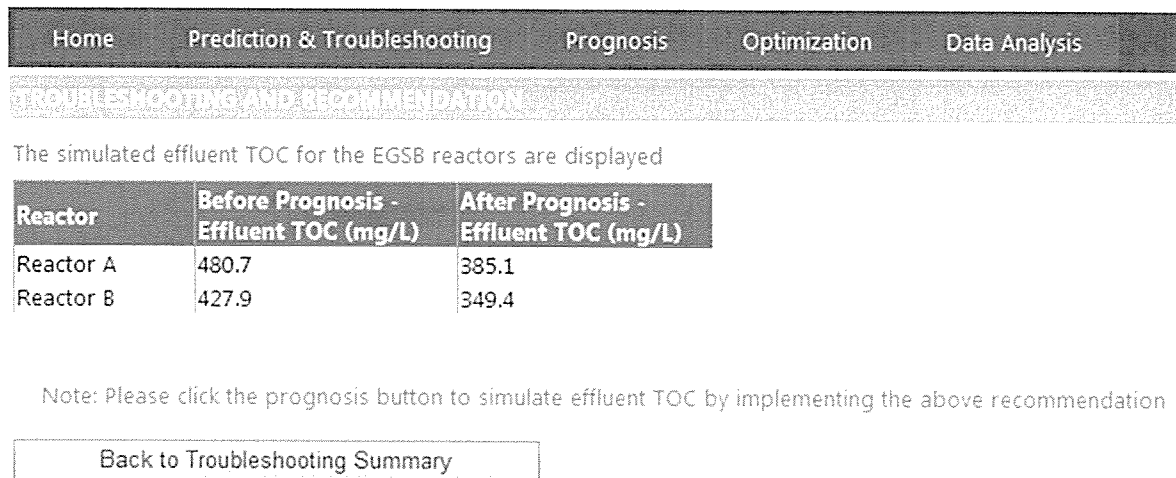


Fig. 9

| Home                                            | Prediction & Troubleshooting       | Prognosis          | Optimization                          | Data Analysis |
|-------------------------------------------------|------------------------------------|--------------------|---------------------------------------|---------------|
|                                                 |                                    |                    |                                       |               |
| Parameter Name                                  | Value                              | Unit               |                                       |               |
| Equalization Tank 1 pH                          | <input type="text" value="6.71"/>  | pH                 | <input type="button" value="Update"/> |               |
| Equalization Tank 1 TOC                         | <input type="text" value="702.0"/> | mg/L               | <input type="button" value="Update"/> |               |
| Influent to Influent Conditioning Tank A/B flow | <input type="text" value="157.4"/> | m <sup>3</sup> /hr | <input type="button" value="Update"/> |               |
| Influent Conditioning Tank A pH                 | <input type="text" value="6.91"/>  | pH                 | <input type="button" value="Update"/> |               |
| Influent Conditioning Tank B pH                 | <input type="text" value="6.91"/>  | pH                 | <input type="button" value="Update"/> |               |
| EGSB effluent temp                              | <input type="text" value="35.9"/>  | °C                 | <input type="button" value="Update"/> |               |
| EGSB effluent pH                                | <input type="text" value="6.92"/>  | pH                 | <input type="button" value="Update"/> |               |
| Equalization Tank 1 ww pH (lab)                 | <input type="text" value="7.14"/>  | pH                 | <input type="button" value="Update"/> |               |
| Equalization Tank 1 ww TOC (lab)                | <input type="text" value="825.3"/> | mg/L               | <input type="button" value="Update"/> |               |
| Equalization Tank 1 ww alkalinity (lab)         | <input type="text" value="8.5"/>   | meq/L              | <input type="button" value="Update"/> |               |

Fig. 10

| Home      | Prediction & Troubleshooting           | Prognosis                             | Optimization                        | Data Analysis |
|-----------|----------------------------------------|---------------------------------------|-------------------------------------|---------------|
| Prognosis |                                        |                                       |                                     |               |
| Reactor   | Before Prognosis - Effluent TOC (mg/L) | After Prognosis - Effluent TOC (mg/L) |                                     |               |
| Reactor A | 146.5                                  | 127.1                                 |                                     |               |
| Reactor B | 153.4                                  | 134.7                                 | <div>Back to Prognosis Detail</div> |               |

Fig. 11

| Home                                                          | Prediction & Troubleshooting | Prognosis        | Optimization | Data Analysis |
|---------------------------------------------------------------|------------------------------|------------------|--------------|---------------|
| The listed TOC before and after optimization for each reactor |                              |                  |              |               |
| Reactor                                                       | TOC Before (mg/L)            | TOC After (mg/L) |              |               |
| Reactor A                                                     | 270.5                        | 233.5            |              |               |
| Reactor B                                                     | 278.0                        | 240.6            |              |               |

| Reactor   | Parameter Name                   | Parameter before | Parameter After | Unit  | Reactor   | Parameter Name                   | Parameter Before | Parameter After | Unit  |
|-----------|----------------------------------|------------------|-----------------|-------|-----------|----------------------------------|------------------|-----------------|-------|
| Reactor A | EGSB A effluent VFA (lab)        | 3.0              | 2.0             | meq/L | Reactor B | EGSB B effluent VFA (lab)        | 3.2              | 2.0             | meq/L |
| Reactor A | EGSB A effluent alkalinity (lab) | 32.3             | 40.0            | meq/L | Reactor B | EGSB B effluent alkalinity (lab) | 31.8             | 40.0            | meq/L |
| Reactor A | EGSB A effluent SO42- (lab)      | 76.4             | 40.0            | mg/L  | Reactor B | EGSB B effluent phenol (lab)     | 32.7             | 10.0            | mg/L  |
| Reactor A | EGSB A effluent phenol (lab)     | 30.5             | 10.0            | mg/L  |           |                                  |                  |                 |       |

[Cost Estimation](#)
[Optimization Adjustment](#)

Fig. 12

| Home                                                                           | Prediction & Troubleshooting | Prognosis   | Optimization | Data Analysis                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------|------------------------------|-------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The information below list details from the optimization module for adjustment |                              |             |              |                                                                                                                                                                                                                  |
| Parameter Name                                                                 | Value Before                 | Value After | Unit         | Recommendation                                                                                                                                                                                                   |
| EGSB A effluent VFA (lab)                                                      | 3.0                          | 2.0         | meq/L        | Consult the operations engineer to reduce EGSB A effluent VFA by increasing Influent Conditioning Tank A pH setpoint.                                                                                            |
| EGSB A effluent alkalinity (lab)                                               | 32.3                         | 40.0        | meq/L        | Consult the operations engineer to increase EGSB A effluent alkalinity by increasing Influent Conditioning Tank A pH setpoint.                                                                                   |
| EGSB A effluent $\text{SO}_4^{2-}$ (lab)                                       | 76.4                         | 40.0        | mg/L         | Recycle EGSB effluent to dilute Equalization Tank 1 sulfate for EGSB A effluent sulfate reduction. Reduce the sulfate content in Equalization Tank 1 by temporarily diverting Customer A ww to Diversion Tank 1. |
| EGSB A effluent phenol (lab)                                                   | 30.5                         | 10.0        | mg/L         | Recycle EGSB effluent to dilute Equalization Tank 1 phenol for EGSB A effluent phenol reduction. Reduce the phenol content in Equalization Tank 1 by temporarily diverting Customer A ww to Diversion Tank 1.    |
| EGSB B effluent VFA (lab)                                                      | 3.2                          | 2.0         | meq/L        | Consult the operations engineer to reduce EGSB B effluent VFA by increasing Influent Conditioning Tank B pH setpoint.                                                                                            |
| EGSB B effluent alkalinity (lab)                                               | 31.8                         | 40.0        | meq/L        | Consult the operations engineer to increase EGSB B effluent alkalinity by increasing Influent Conditioning Tank B pH setpoint.                                                                                   |
| EGSB B effluent phenol (lab)                                                   | 32.7                         | 10.0        | mg/L         | Recycle EGSB effluent to dilute Equalization Tank 1 phenol for EGSB B effluent phenol reduction. Reduce the phenol content in Equalization Tank 1 by temporarily diverting Customer A ww to Diversion Tank 1.    |
| <a href="#">Back to Optimization Result</a>                                    |                              |             |              |                                                                                                                                                                                                                  |

Fig. 13

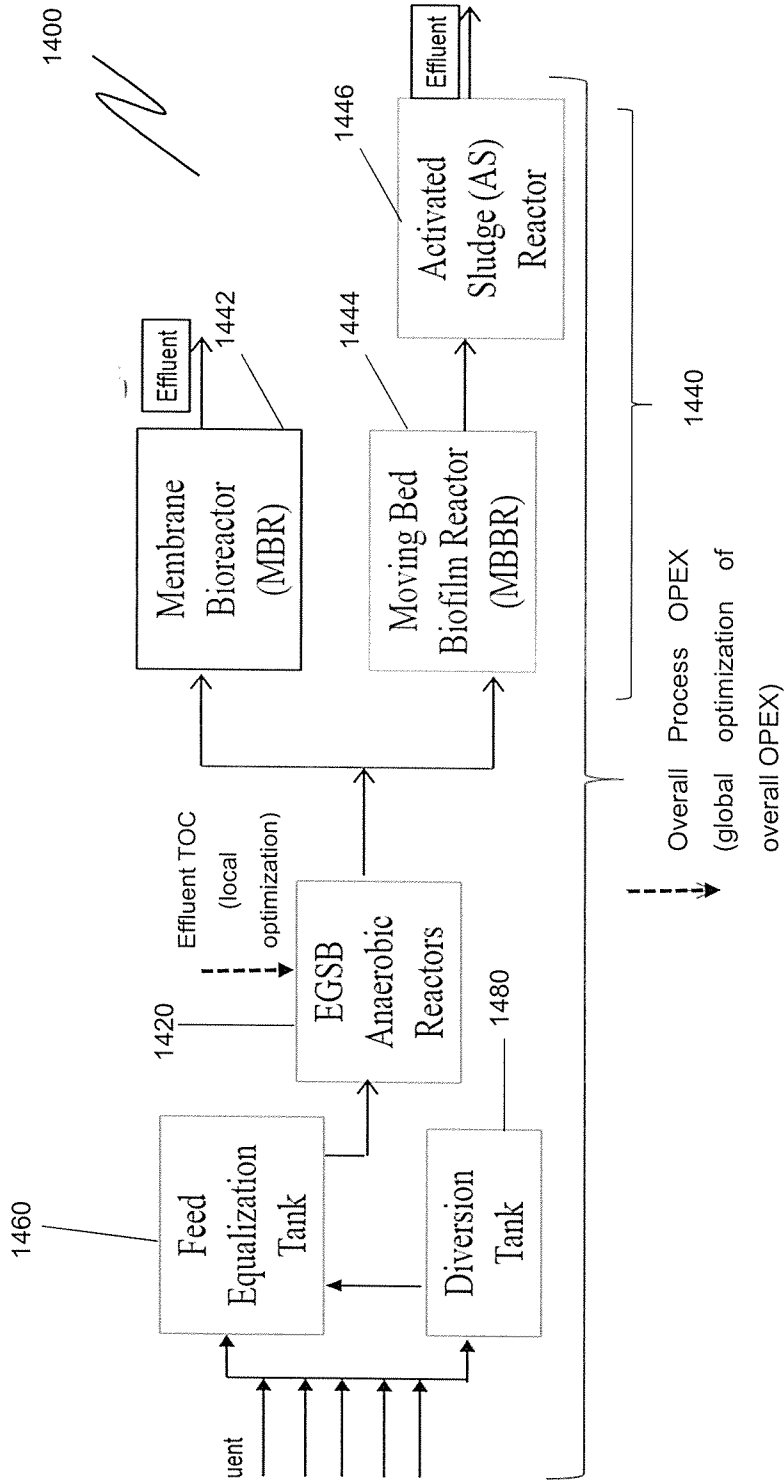


Fig. 14

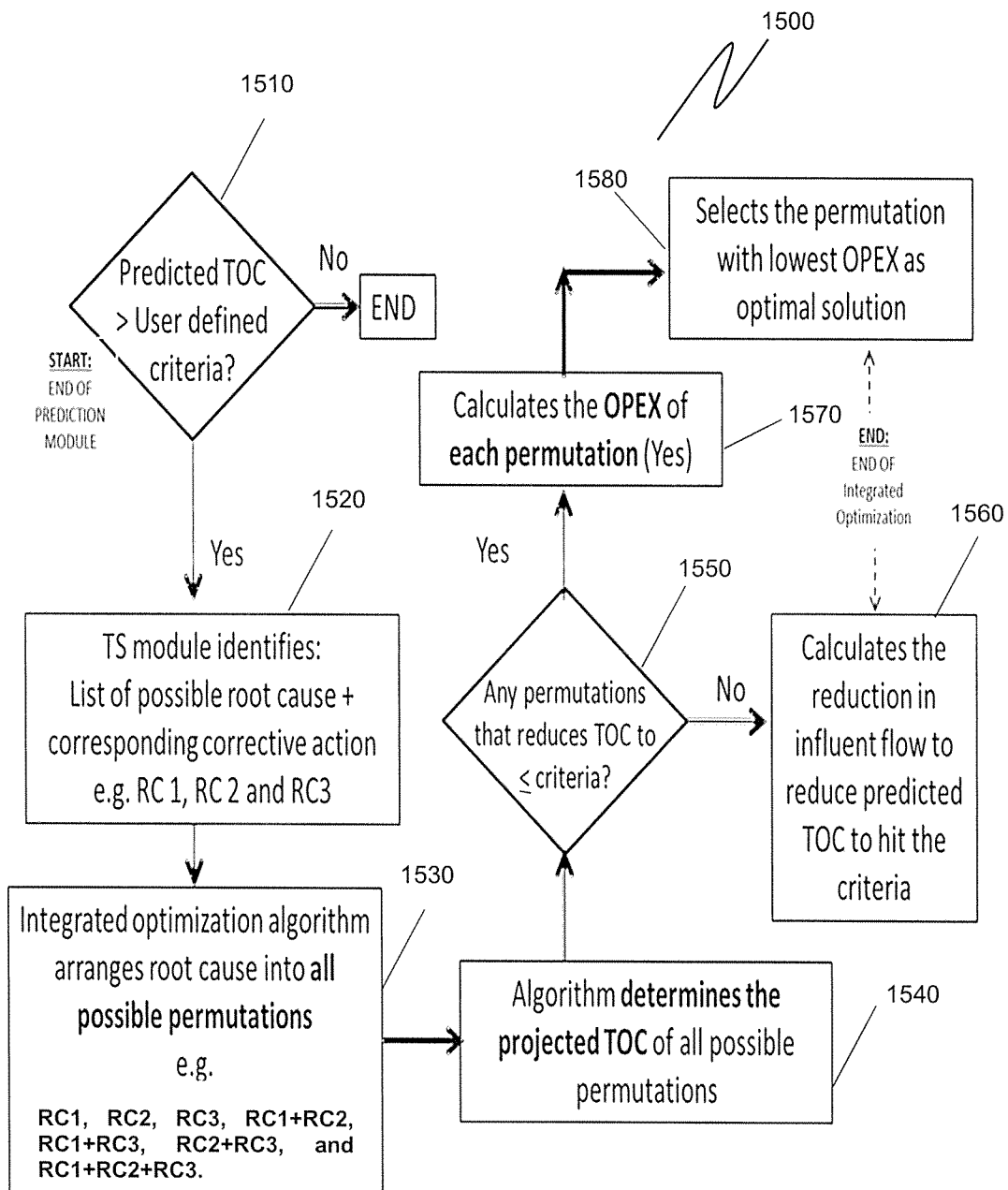


Fig. 15

| Process                              | Control Parameter | Examples of corrective actions                          |
|--------------------------------------|-------------------|---------------------------------------------------------|
| EGSB                                 | TOC               | temp, influent concentration, recirculation flow ...    |
|                                      | pH                | Influent pH, acid/base addition, influent alkalinity... |
|                                      | TSS               | recirculation flow, influent TSS, process pH etc..      |
| Aerobic Processes<br>(MBBR, AS, MBR) | TOC               | DO, pH, MLSS, influent concentration, ...               |
|                                      | PO4               | Influent PO4, MLSS, ...                                 |
|                                      | NH3               | Influent NH4, DO, alkalinity, ...                       |

Fig. 16