

APPLICATION NOTE

ECOLOGICAL AND ENVIRONMENTAL ANALYSIS AND RESEARCH

Continuous Monitoring of Total Organic Carbon (TOC) in High Concentration Suspended Particulate Containing Waste Water

Introduction

Fast monitoring of total organic carbon (TOC) of water is crucial for some environmental and industrial applications. Determination of total organic carbon (TOC) in water is complex when water contains high concentration of suspended particles. Generally, inorganic carbon content of the water is much higher than the organic carbon, TOC determination by difference method will not be suitable because it can lead to large statistical error. For the analysis of water NPOC method (non purgeable organic carbon) is therefore used. Firstly, water sample is acidified to pH value of 2 or below. After all the inorganic carbon purged, the residual carbon analyzed as non-volatile organic carbon. In this work, TOC in synthetically prepared waste water, which has high concentration of suspended particles below 600 μ m, monitored with Trl-onlineTOC-hSS.

Principle of operation

Waste water samples was prepared by synthetically by mixing tap water with sieved soil fractions and samples, periodically introduced to sparger, were acidified automatically in the sparger to purge the inorganic carbon. Then, 300 μ l of the acidified sample introduced into two zone furnace by the help of peristaltic pump which prevent any blockage at the process lines.

Table 1: TC and IC Analysis Parameters

| Parameters | Total Carbon (TC) |
|--|-------------------|
| Method Mode | TOC Mode |
| Decomposition furnace temperature | 800 °C |
| Catalytic furnace temperature | 500 °C |
| Air pressure | 2 bar |
| Carrier gas flow rate | 100 mL/min |
| Analysis period | 20 minutes |
| Sample Size | 300 μ L |
| Sparge Time | 4 minutes |
| Acidification | 0.5 % by volume |

Results

Table 2: TOC results of 5 g/L TSP (below 600 μ m) containing waste water

| Repeat Number | Results (ppm) | Repeat Number | Results (ppm) |
|---------------|---------------|---------------|---------------|
| 1 | 20.21 | 22 | 18.31 |
| 2 | 20.69 | 23 | 17.87 |
| 3 | 19.85 | 24 | 20.31 |
| 4 | 17.70 | 25 | 17.29 |
| 5 | 19.03 | 26 | 20.66 |
| 6 | 18.47 | 27 | 18.08 |
| 7 | 19.20 | 28 | 19.42 |
| 8 | 18.54 | 29 | 18.98 |
| 9 | 18.08 | 30 | 18.95 |
| 10 | 19.94 | 31 | 19.15 |
| 11 | 16.40 | 32 | 19.57 |
| 12 | 19.76 | 33 | 18.18 |
| 13 | 18.55 | 34 | 18.78 |
| 14 | 16.32 | 35 | 17.54 |
| 15 | 16.48 | 36 | 17.51 |
| 16 | 16.55 | 37 | 20.19 |
| 17 | 18.80 | 38 | 17.13 |
| 18 | 18.78 | 39 | 17.50 |
| 19 | 17.11 | 40 | 18.22 |
| 20 | 17.25 | 41 | 18.58 |
| 21 | 17.81 | 42 | 17.81 |

In table 2, obtained TOC results were shown by analyzing of 5 g/L TSP (below 600 μ m) containing waste water . The rsd value of the results calculated as 6.40%. Also, in figure 1 graphical representation of this results was shown.

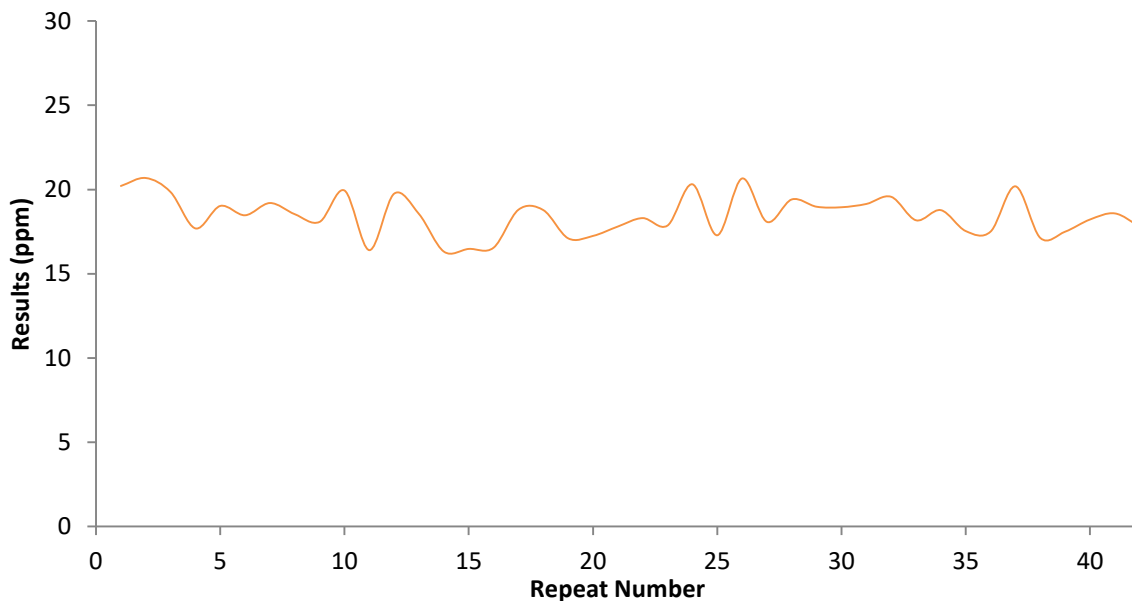


Figure 1: Graphical representation of TOC results of 5 g/L TSP (below 600µm) containing waste water

Table 1: TOC results of 3 g/L TSP (below 600µm) containing waste water

| Repeat Number | Results (ppm) | Repeat Number | Results (ppm) |
|---------------|---------------|---------------|---------------|
| 1 | 13.96 | 16 | 14.93 |
| 2 | 13.65 | 17 | 14.69 |
| 3 | 15.14 | 18 | 13.83 |
| 4 | 14.01 | 19 | 14.22 |
| 5 | 13.16 | 20 | 15.02 |
| 6 | 13.02 | 21 | 13.99 |
| 7 | 14.18 | 22 | 14.05 |
| 8 | 13.08 | 23 | 14.39 |
| 9 | 15.41 | 24 | 13.89 |
| 10 | 13.82 | 25 | 13.25 |
| 11 | 13.32 | 26 | 13.85 |
| 12 | 14.23 | 27 | 13.12 |
| 13 | 14.60 | 28 | 13.03 |
| 14 | 15.69 | 29 | 13.18 |
| 15 | 16.59 | | |

In table 2, TOC results were shown by analyzing of of 3 g/L TSP (below 600µm) containing waste water . The rsd value of the results calculated as 6.23 %. Also, in figure 2 graphical representation of this results was shown.

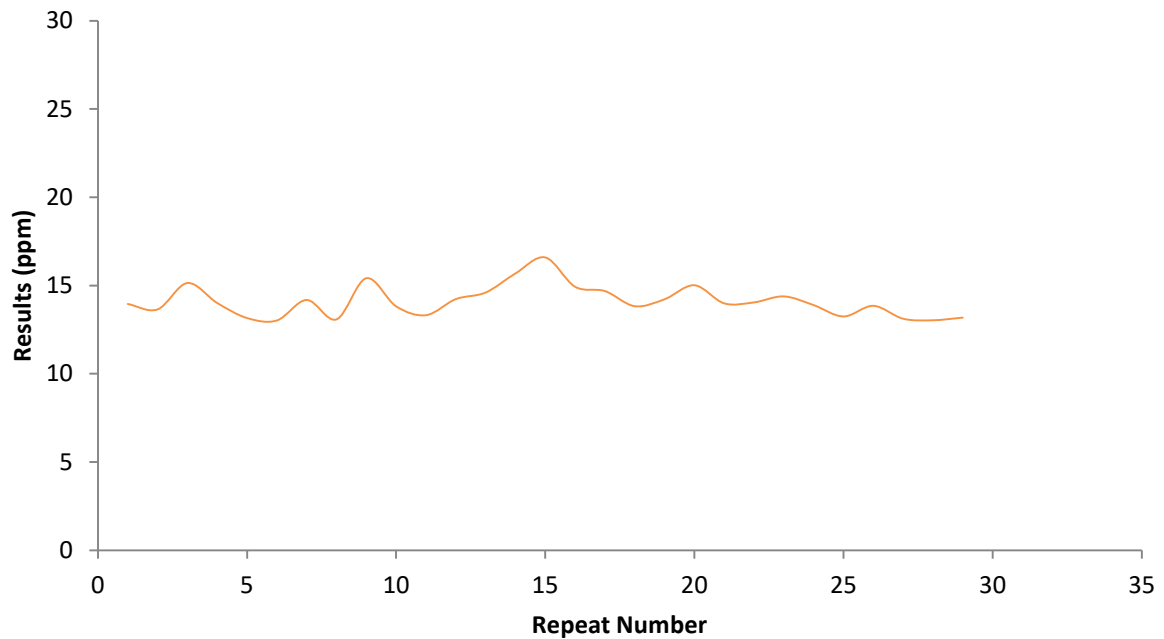


Figure 2: Graphical representation of TOC results of 3 g/L TSP (below 600µm) containing waste water

Conclusions

In this study, TOC of waste water, has soil particles below 600 µm, was analyzed with two different concentration with Trl-OnlineTOC-hSS analyzer. In many application, analyzing of high tsp containing liquids is very difficult due to particulate character of the sample however according to results online monitoring of TOC of high tsp containing sample was achieved with Trl-OnlineTOC-hSS successfully. As regards results, Trl-OnlineTOC-hSS can analyze samples have very high tsp concentration up to 600 µm particle size with reasonable RSD values without any blockage or any other problem at the process lines.