A Fast Way to Evaluate Environmental Monitoring Results by Excel

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Abstract. Based on much more data and complicated evaluation in environmental monitoring data processing, his paper uses Excel function to edit self-defined IF function to evaluate environmental monitoring data. Taking pH, dissolved oxygen, permanganate index, chemical oxygen demand, ammonia nitrogen and total phosphorus data processing as examples, the process of establishing IF function is explained.

1. Introduction

Environmental monitoring refers to the activities of environmental monitoring agencies to monitor and measure environmental quality. Environmental monitoring is to monitor and measure indicators that reflect environmental quality to determine the level of environmental pollution and environmental quality. The contents of environmental monitoring mainly include monitoring of physical indicators, monitoring of chemical indicators and monitoring of ecosystems [1]. Environmental monitoring is the use of modern scientific and technological means such as chemistry, physics, biology, medicine, telemetry, remote sensing, and computer to monitor, measure, and monitor various types of landmark data that reflect environmental quality and its changing trends, thereby making a comprehensive evaluation of environmental quality [2]. When monitoring surface water in China, the surface water environmental quality standard GB 3838-2002 (hereinafter referred to as the standard) of the People's Republic of China is used as the basis for monitoring and evaluation. After measuring, calculating, and processing the data, the monitoring personnel compare with the standard and evaluate the standard for determining the water sample. Because of the large number of monitoring points and large amount of data, it takes a lot of time to compare one by one, although there are some related software evaluations on the market. However, such software requires a certain amount of programming knowledge, and ordinary environmental monitors cannot fully apply such software. In this paper, with the powerful function of Excel and the surface water environment quality standard GB 3838-2002 of the People's Republic of China, a series of Excel functions are designed to evaluate the monitoring results in batches, which is fast, easy to grasp and practical. Taking the data of pH, dissolved oxygen, permanganate index, chemical oxygen demand, ammonia nitrogen and total phosphorus as an example, the application of Excel function in environmental monitoring data processing is briefly introduced.
Table 1 Standard values of basic items of surface water environmental quality standards

| Serial number | Project | Unit | Measured value | Evaluation |
|---------------|---------|------|----------------|------------|
| 1 | pH (dimensionless) | Dimensionless | 8.13 | I |
| 2 | Dissolved oxygen \(\geq\) | mg/L | 6.9 | II |
| 3 | Permanganate index \(\leq\) | mg/L | 5.6 | III |
| 4 | Chemical oxygen demand (COD) \(\leq\) | mg/L | 14 | I |
| 5 | Total phosphorus (calculated in P) \(\leq\) | mg/L | 0.15 | III |
| 6 | Ammonia nitrogen \(\leq\) | mg/L | 0.24 | II |

2. The IF function and application used in the evaluation

Conditional function IF. Function: According to the specified conditions, judge its "true" (TRUE), "false" (FALSE), according to the true and false values calculated by the logic, and return the corresponding content. You can use the function IF to conditionally evaluate values and formulas. Application: Judging the effectiveness of monitoring data according to the basic project standard limits of surface water environmental quality standards.

3. Evaluation example

Taking a surface water monitoring data processing as an example, the establishment of Excel function and the data evaluation process are introduced.

In the environmental monitoring, the monitoring points are scattered and there are many projects. For the same project, each measuring point has corresponding data. The measured data is evaluated according to the basic project standard limits of the surface water environmental quality standard. Due to the large amount of data, each data must evaluate the monitoring results against the standard, resulting in an increase in workload, in order to simplify the data evaluation process and reduce the evaluation error, the IF function can be edited, and the results can be directly evaluated based on the monitoring data, and the surface water monitoring data is described (see Table 2).

Table 2. Monitoring data of a test point

| Serial number | Project | Unit | Measured value | Evaluation |
|---------------|---------|------|----------------|------------|
| 1 | pH | Dimensionless | 8.13 | I |
| 2 | Dissolved oxygen \(\geq\) | mg/L | 6.9 | II |
| 3 | Permanganate index \(\leq\) | mg/L | 5.6 | III |
| 4 | Chemical oxygen demand (COD) \(\leq\) | mg/L | 14 | I |
| 5 | Total phosphorus (calculated in P) \(\leq\) | mg/L | 0.15 | III |
| 6 | Ammonia nitrogen \(\leq\) | mg/L | 0.24 | II |
Enter the data from Table 2 above into the Excel 2010 worksheet. Assume that the pH, dissolved oxygen, permanganate index, chemical oxygen demand, total phosphorus, and ammonia nitrogen are measured in D2, D3, D4, D5, D6, and D7, respectively, the cells in the evaluation are E2, E3, E4, E5, E6, and E7 respectively. Enter "=IF(AND(D2>=6, D2<=9), "I", IF(D2>9, "bad V", IF (D2<6, "bad V")))" in E2 cell, D2 cell input data 8.13, then E2 cell displays I. Enter "=IF(D3>=7.5," I", IF(D3>=6," II"," III", IF(D3>=3," IV", IF (D3<2, " bad V"))))" in E3 cell, D3 cell inputs data 6.9, and the E3 cell displays II. Enter "=IF(D4<=10," I", IF(D4<15, " II", IF(D4<=16, " III", IF(D4<=10, " IV", IF (D4>15, "bad V"))))" in E4 cell, D4 cell input data 5.6, then E4 cell shows III. Enter "=IF(D5<=15," I", IF(D5<=20," II", IF(D5<=30," III", IF(D5<=40," IV", IF (D5>40, "bad V"))))" in E5 cell, D5 cell input data 14, then E5 cell displays I. Enter "=IF(I18<=0.02," I", IF(I18<0.1, " II", IF(I18<0.2," III", IF(I18<0.3," IV", IF (I18<0.4, "V", IF (I18>0.4, "bad V"))))))" in E6 cell, D6 cell input data 0.15, then E6 cell shows III. Enter "=IF(D7<=0.15," I", IF(D7<=0.5," II", IF(D7<1," III", IF(D7<1.5," IV", IF (D7 <= 2, "V", IF (D7> 2, "bad V"))))))" in E7 cell, D7 cell input data 0.24, then E7 cell shows II.

4. Comparison of work efficiency

In order to verify the efficiency of the IF function to improve the data evaluation, compare the application of the IF function with the data into the standard table, and compare the required time, taking the data of Table 3 as an example.

| Serial number | Project | 10 sets of data | 20 sets of data | 30 sets of data |
|---------------|---------|----------------|----------------|----------------|
|               |         | Apply IF function evaluation | Bring into the form query | Apply IF function evaluation | Bring into the form query | Apply IF function evaluation | Bring into the form query |
| 1             | pH      | 20seconds       | 43seconds       | 38seconds       | 100seconds      | 56seconds       | 130seconds       |
| 2             | Dissolved oxygen≥2 | 21seconds       | 67seconds       | 42seconds       | 180seconds      | 63seconds       | 300seconds       |

From the above table, it can be clearly found that when using the IF function in Excel to evaluate the monitoring data, it is only necessary to input the measured value into the corresponding cell, and the evaluation cell automatically displays the evaluation result. The time of each item is the time of data input, and the time is basically the same. The measured value is brought into the standard query, and the time is obviously increased. The more the data amount, the more time is used. Applying the IF function in Excel to evaluate the monitoring data significantly improves the work efficiency.

5. Conclusion

In laboratory data analysis, data evaluation is often applied in Excel spreadsheets. Excel is a data processing program in Office programs. It is easy to use and powerful. Make full use of the unique functions of the program IF function, solve the problems of environmental monitoring work, and the difficulties of evaluation and complexity, and greatly improve work efficiency, should be a better choice.

References
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