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Brihamumbai Municipal Corporation Integrated Solid Waste Management at Mumbai

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ABSTRACT: The excessive consumerism in 21st century has lead to increase of generation of solid wastes in town and cities. The increased per capita income in cities also contributed to increased diversity of solid waste. The solid waste handling has become a burden on the economy of the Municipalities and corporations. Hence, in all the developing countries, open dumping of solid waste is the common practice. Solid Waste includes all the discarded solid materials from commercial, municipal, industrial and agricultural activities. Land filling is the preferred method of Municipal Solid Waste (MSW) disposal. However, poorly designed land filling can create contamination of ground water, soil and air. As water percolates through the landfill, contaminants are leached from the solid waste. Leachate is produced when moist enters the refuse in a landfill, extracts contaminants into the liquid phase and produces moist content sufficient by high to initiate liquid flow. The initial change of quality appears in pH, Total Dissolved Solids, total Hardness and chlorides. The young dumpsites, where the dumping is actively carried out, generate more leachate and as the dump gets older the solid waste gets stabilized and the adverse impacts are also minimized.

KEYWORDS: Text detection, In painting, Morphological operations, Connected component labelling.

I.INTRODUCTION

1.1 GENREAL:

Of all the natural resources, water is unarguably the most essential and precious. Life began in water, and life is nurtured with water. There are organisms, such as anaerobes, which can survive without oxygen. But no organism can survive for any length of time without water. The crucial role of water as the trigger and sustainer of civilizations has been witnessed throughout the human history, no life without water is a common saying (Abbasi et al., 1996). Water is the most abundant and essential compound in all the living systems. Water has played a crucial role in the process of chemical evolution by facilitating the formation of living molecules from simple molecular arrangements. It is a universal solvent, and as a solvent it provides the ionic balance and nutrients, which support all forms of life (Shastri, 2000). The amount of water on the planet earth is estimated to be approximately 1388 million billion cubic meters. Of this total amount, major part 1348 million billion cubic meters (97.3%) is constituted by the salt water in the oceans. Only 37.5 billion cubic meter (2.7%) water occurs in the form of fresh water. Of this total fresh water, 28200 thousand billion cubic meter (2.04%) is in the form of polar ice and glaciers, 8450 thousand billion cubic meter (0.61%) as ground water and 127 thousand billion cubic meters in the form of lakes, rivers, etc.(CPCBI,1991). In India, the major source of water used to meet the domestic, agricultural and industrial needs is the ground water. Almost 61% of the needs are fulfilled with ground water, 29% from canals, 5% from reservoir tanks and another 5% from other sources; in Maharashtra state the dependence on the ground water is still more reaching up to about 65% (CPCB, 2005).

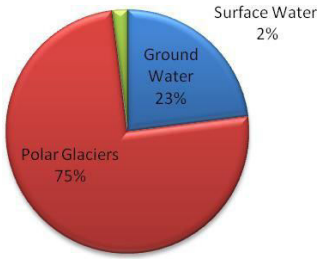

Fig 1.1 : Distribution of fresh water in nature (CPCB,1991)

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II. RELATED WORK

The concept of image inpainting was first introduced by Bertamio et al. [1]. The method was inspired by the real inpainting process of artists. The image smoothness information interpolated by the image Laplacian is propagated along the isophotes directions, which are estimated by the gradient of image rotated by 90 degrees. Exemplar Based method proposed by Criminisi et al. [2] used a best exemplar patch to propagate target patch including missing pixels. This technique uses an approach which combine structure propagation with texture synthesis and hence produced very good results. In [3], the authors decompose the image into sum of two functions and then reconstruct each function separately with structure and texture filling-in algorithms. Morphological technique is used to extract text from the images presented in [4]. In [5], the inpainting technique is combined with the techniques of finding text in images and a simple algorithm that links them. The technique is insensitive to noise, skew and text orientation. The authors in [6] have applied the CCL (connected component labelling) to detect the text and fast marching algorithm is used for Inpainting.

The work in this paper is divided in two stages. 1) Text- Detection 2) Inpainting. Text detection is done by applying morphological open-close and close-open filters and combines the images. Thereafter, gradient is applied to detect the edges followed by thresholding and morphological dilation, erosion operation. Then, connected component labelling is performed to label each object separately. Finally, the set of selection criteria is applied to filter out non text regions. After text detection, text inpainting is accomplished by using exemplar based Inpainting algorithm.

III.METHODOLOGY

METHODS

The physico-chemical analysis was done for four years at all the six stations selected for the present study. Six samples were collected in alternate months in a year. A total of 144 samples were collected during the study period from these six stations. The parameters studied were: pH, total dissolved solids, total hardness, chlorides, nitrates, sulphates, phosphates, phenols, cyanide, iron, zinc, nickel, copper, chromium and cadmium. Standard procedures of Bureau of Indian Standards (2012) were adopted for analyses of the parameters. The samples were collected in one litre polyethylene bottles. All the parameters were analyzed within 24 h after collection of samples. The estimated values of the parameters were expressed in mg/l, except where specifically stated. The monthly and annual means and standard deviations were calculated for each parameter and were mentioned in the respective tables.

1.4.1 Physico-chemical analysis

The monthly and annual means and standard deviations were calculated for each parameter and were mentioned in the respective tables.

1. pH @ 25°C
2. Total Dissolved Solids & Total Suspended Solids
3. Chloride
4. Total hardness
5. Nitrate
6. Sulphate
7. Iron
8. Zinc

1. pH (potentio Hydrogeni)

The digital pH meter model SensION+ pH3 by HACH instrument after calibrating at 4.0, 7.0 and 9.25. 100 ml of water sample was taken in a beaker and stirred slowly, then the electrode was dipped into the sample. After 5 seconds, the value displayed on LED screen which was recorded directly.

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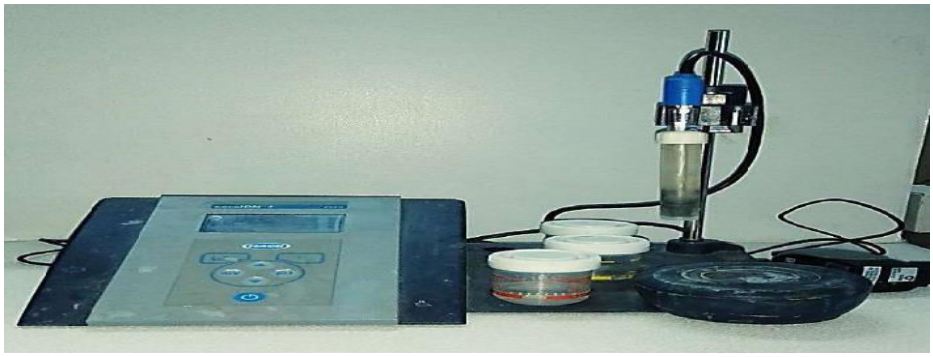

Fig 1.2: SensION+ pH3 by HACH

2. Total Dissolved Solids (TDS):
A two step process was followed as described in the NEERI Manual. First the total solids were estimated followed by total suspended solids. By deducting the total suspended solids from the total solids, the total dissolved solids were estimated.

a. Total Solids:
A clean evaporating dish was ignited at 550° C in a Muffle furnace for on hour. Then dish was cooled weighed (W1) and kept in a desiccators. 50 ml of sample was transferred to the dish and evaporated to dryness on a steam bath. After complete evaporation the sample was oven dried at 103°C for one hour. The drying was repeated at 103°C till constant weight was obtained (W2). Total solids mg/L. = (w1-w2) * 1000 / ml of sample

b. Total Suspended Solids (TSS):
A filter disk was placed on the bottom of a clean Gooch crucible. 20 ml distilled water was poured and vacuum was applied. The crucible was oven dried at 103°C for one hour and then inserted in a desiccator. The crucible was weighed (W1) and placed on a suction unit. 25 ml sample was poured using a pipette. The pipette was washed with distilled water and the washings were also poured into the crucible. After filtration crucible was oven dried at 103°C for one hour and then cooled.
Then the Total Dissolved Solids were estimated as follows:
Total Dissolved Solids (TDS) mg/l = Total Solids — Total Suspended Solids

3. Chlorides:
50 ml of water sample was taken in a distilled water rinsed 250 ml conical flask using a precalibrated 50 ml bulb pipette. One ml of Potassium chromate indicator was added using a 2 ml graduated pipette. Titrated with 0.0141 N silver Nitrate standard solution using a 50 ml graduated burette with a white porcelain tile underneath the conical flask till a reddish-tinge precipitate appears thought the sample solution, which is the end point of the titration. The rundown burette reading was noted down (Consumption volume of standard silver nitrate solution). A blank titration with 50 ml of distilled water was also carried out and noted the reading.

4. Total Hardness (mg/l):
50 ml of the sample was taken in a conical flask to which 1 ml of buffer and 1 ml of 1ml of inhibitor were added. The contents were mixed well and a pinch of EBT indicator was added. The contents were stirred well and titrated against 0.01 M EDTA till wine red changed to blue. A reagent blank was also taken. The vol. of EDTA rundown was recorded.
Calcium hardness: 50 ml of sample was taken in a conical flask and 1 ml of Sodium hydroxide was added then a pinch of Murexide indicator was also added and the contents were mixed well. The contents were titrated against 0.01 M EDTA till the colour changed to purple. The vol. of EDTA rundown was recorded.
Calculation
Total hardness as CaCo3 mg/l = C x D x 1000 /ml Sample

Where, C= volume of EDTA required by sample
D=mg CaCo3 equivalent to 1 ml EDTA titrant
b. Calcium hardness CaCo3 as mg/l = C1 x D x 1000 / ml sample
Where C1= volume of EDTA used by sample
D =mg CaCo3 equivalent to 1 ml EDTA titrant

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c. Magnesium hardness = Total hardness as CaCO3 — Calcium hardness as CaCO3, mg/l
d. Alkaline (Carbonate) hardness and non-alkaline (non — carbonate) hardness
These types of hardness can be calculated from total hardness and total alkalinity as follows:
1. If total hardness as CaCO3 > total alkalinity as CaCO3
Then, a. Alkaline hardness = Total hardness — Total alkalinity
b. Non-alkaline hardness = Total hardness — Total alkalinity
2. If total hardness as CaCO3 < total alkalinity as CaCO3
Then, a. Alkaline hardness = Total hardness
b. Non alkaline hardness = Nil

5. Nitrates Nitrogen (as NO3N)
Nitrates of the sample were estimated by using phenol Disulphonic Acid (PDA) method. 150 ml of sample was taken in a beaker and 3 ml of aluminium hydroxide was added to remove colour. Then the sample was stirred well, allowed to settle and filtered. The filtrate was taken for further process. The nitrites were removed using permanganate. 1 ml sulfamic acid was used to suppress NO;. The chlorides were removed by precipitation by adding Silver Sulphate. The sample was taken in a beaker and the contents were evaporated to dryness in a water bath. Then the residue was dissolved in 2 ml of Phenol Disulphonic Acid reagent. The contents were transferred to Nessler's tubes. Then 8 ml of KOH was added. EDTA was added to dissolve the precipitate. Then the contents were filtered and made up to 100 ml. A blank was also prepared using distilled water. Then the colour developed was read at 410 nm in a UV — Visible spectrophotometer (Elico Model SL 177) The NOs was recorded as N in mg/l. A calibration curve was also prepared using known concentrations derived from stock nitrate solution. The stock nitrate solution was prepared by dissolving 721.8 mg anhydrous potassium nitrate and dilute to 1000 ml with distilled water. This solution contained 1 ml 100 mg.

6. Sulphates:
Estimation of Sulphates: (Turbidimetric Method) 1000mg/L. So® stock sulphate solution, 100 mg/L. So% working sulphate solutions were prepared. Barium chloride crystals of 20-30 mesh were used. 30g magnesium chloride, 5g sodium acetate, 1.0g potassium nitrate, and 20 ml acetic acid in 500 ml distilled water were mixed and made up to 1000ml buffer solution. A series of standard solutions containing 0 to 50.0 mg/l SO*; were prepared from standard sulphate solution in 25 ml volumetric flasks. 100 ml of sample was taken in 250 ml Erlenmeyer flask in which 20 ml buffer solution was added and mixed in a stirring apparatus. Barium chloride crystals were added while stirring. The same procedure was adopted for sulphate standard solutions and reagent blank. The turbidity of the solution was measured. A calibration curve was plotted for the concentrations of sulphate in the standards against their corresponding turbidities. To a 20.0 ml of standard sodium carbonate (0.01M) solution, 3 drops of methyl orange indicator was added and diluted to 100 ml with distilled water. The solution was titrated with HCI solution to be standardized with continuous stirring until the color of the solution turned from yellow to pink. The same procedure was adopted for reagent blank. The concentration of HCl was calculated. 20.0 ml of sample was taken without filtration or alteration with which 3 drops of phenolphthalein indicator solution was added and diluted to 100 ml with distilled water. The solution was titrated using standardized HCI, until the pink color of the solution disappears. Next, 3 drops of methyl orange indicator was added. The titration was continued slowly with continuous stirring until the solution color changed from yellow to pink. The same procedure was adopted for blank also. Total alkalinity (T-Alkalinity) was calculated from the titer values.

7. Estimation of Iron as Fe:
Sample Preparation The standard solutions were prepared by appropriate dilution of the following stock metal solutions with distilled water containing 1.5 mL conc HNOs/L. The reagents of AR Grade were used. 50 ml water sample is added with 5 ml concentrated metal free nitric acid and digested the content, using EPA method in Micro-wave digestion system Anton Paar along with the distilled water blank. Digested sample and blank were concentrated and made up to 50 ml using standard flask with distilled water. The homogenized sample & blank transferred to pre-cleaned PP bottles. These acid extract samples were analysed for Iron using pre-standardized/ Calibrating Atomic absorption spectrophotometer (GBC — Avantha) in concentration mode and making the absorbance / concentration zero' with blank.
Calculation:
Iron: Concentration from instrument mg/L. x Dilution factor = mg/L Iron as Fe. AAS instrument is standardized with 1.0, 2.0, 3.0, & 4.0 mg/L. standards for Iron

8. Estimation of Zinc:
Sample Preparation The standard solutions were prepared by appropriate dilution of the following stock metal

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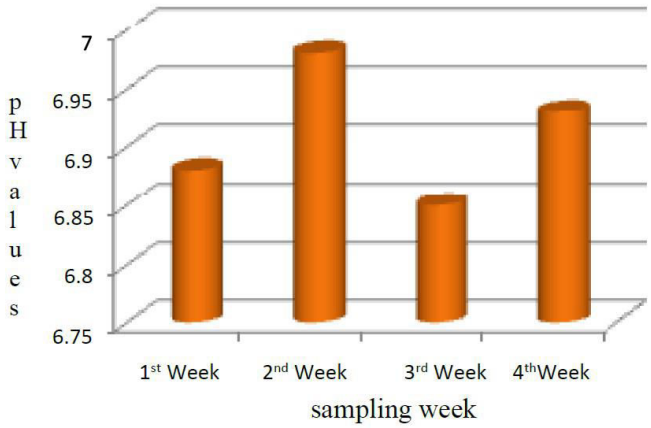
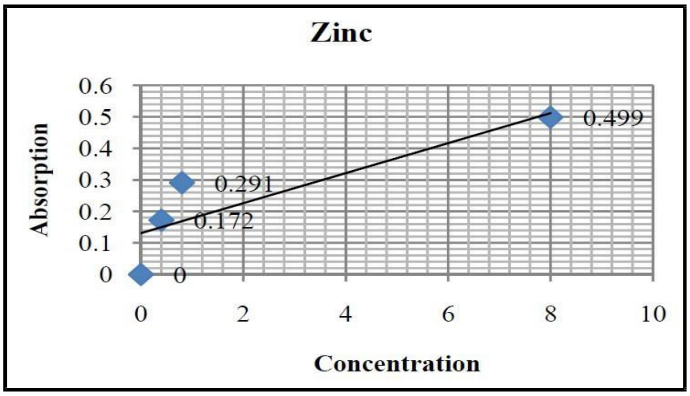
solutions with distilled water containing 1.5 ml conc HNOs/L.. The reagents of AR Grade were used.
Zinc stock solution corresponding to 1000mg/1 of Zn Dissolve 0.100 g zinc metal in 0 mL 1+1 HCl and dilute to 1000mL with water; 1.00 mL = 100 lg Zn. Suitable aliquots of solutions were taken for further analysis. Calibration Curve for Zinc Experimental results

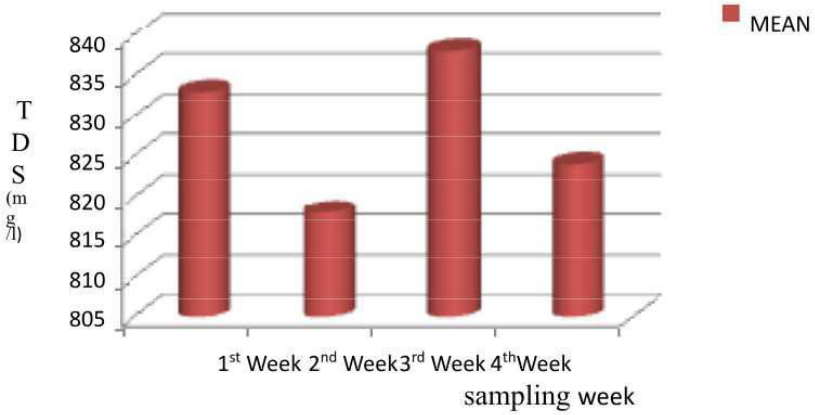
IV. RESULT AND DISCUSSION



Graph 1.1: Graph showing the annual means of pH of ground water at Gorai (Station I)during the study period



Graph 1.2: showing the annual means of Tot



Graph 1.3 : showing the annual means of Concentrations of Chlorides (mg/l) in the groundwater at the outskirts of Gorai (Station I) during the study period

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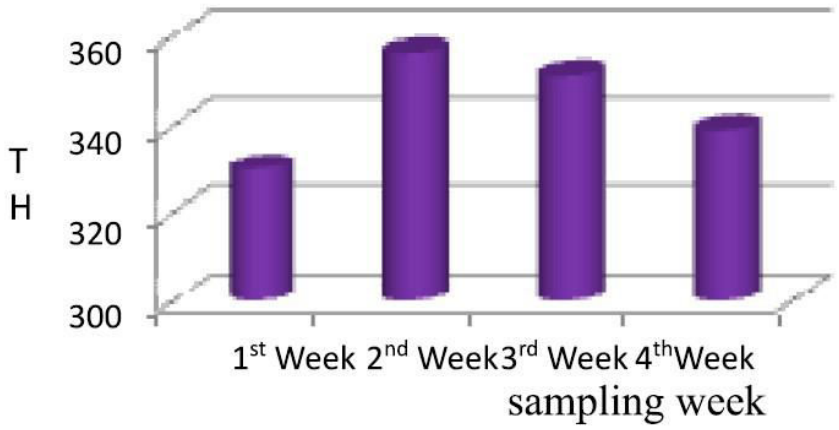
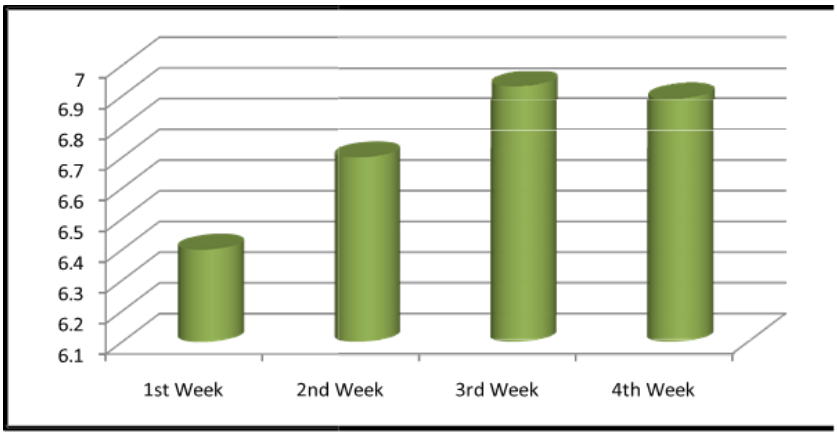
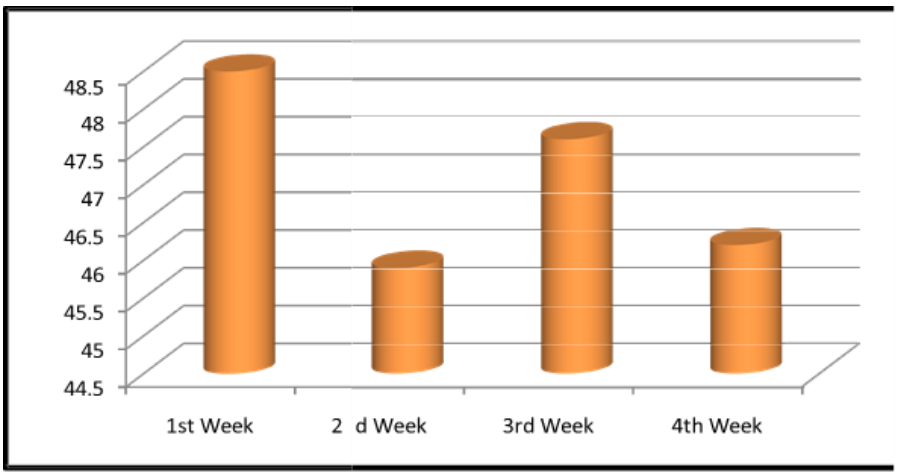


Graph 1.4: showing the annual means of Concentrations of Nitrate Nitrogen (mg/l)ground water at the outskirts of Gorai (Station I) during the study period



Graph 1.5: showing the annual means concentration of Sulphates (mg/l) in the groundwater at the outskirts of Gorai (Station I) during the study period



Graph 1.6: showing the annual means of Concentrations of Iron (mg/l) in the ground waterat the outskirts of Gorai (Station I) during the study period

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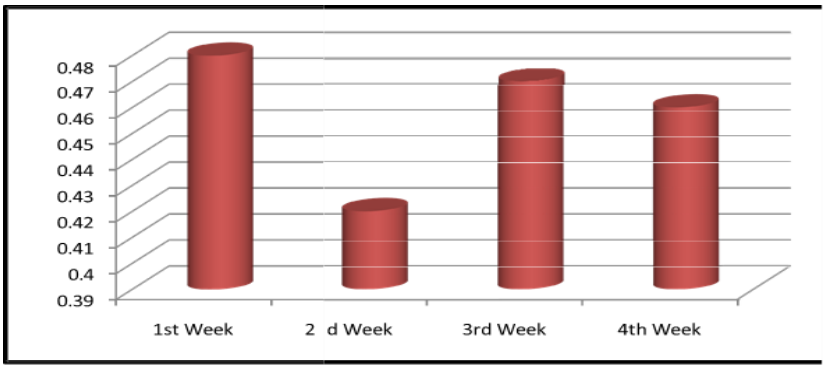

Graph 1.7: showing the annual means of Concentrations of Zinc (mg/l) in theground water at the outskirts of Gorai(Station I) during the study period

V.CONCLUSION

The investigation of groundwater around MSW dumpsite of Mumbai reveals that 100% of samples during post-monsoon were unfit for drinking and other domestic purposes on the basis of TDS and other parameters. During post-monsoon period all physical and chemical parameters of all ground water samples were abnormally increased which could be due to the leaching of MSW from the open landfills. This indicates that domestic waste leads to more critical problem to the peoples who are living nearby the dumpsite and suggests lack of sufficient sanitary facilities due to uncontrolled urbanization. The highest correlation was found between EC and chloride. The high content of chloride comes mainly from paint and chemical industries. Trace metal study indicates that during both pre and post-monsoon, concentration of Fe was high in many stations. Pb, Mn and Cr were found to be high in all samples. The findings clearly indicate that the ground water and soil of the study area is heavily polluted especially with toxic heavy metals besides high TDS and other inorganic major constituents. The findings of the study also indicate that there is a need for proper industrial planning and the safe disposal of industrial and urban waste which would otherwise lead to severe environmental degradation.

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