



GROUNDWATER QUALITY ASSESMENT FOR INDUSTRIAL PURPOSES OF GAJWEL TALUK, MEDAK DISTRICT, A. P.

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ABSTRACT

Gajwel taluk is at a very short distance from the capital city, Hyderabad of Andhra Pradesh. As it is a potential area for demand for industrial development, in view of the lack of detailed investigations on groundwater quality, a comprehensive assessment of the suitability of groundwater for industrial purposes by Langelier Saturation Index method was taken up. Such studies are warranted not only because of future demands for developmental activities but also due to the geographical disposition of the area in the semi arid tracts with meagre perennial sources of surface flows and also experiences frequent water shortages owing to the vagaries of the monsoon. An attempt has been made to assess the quality of groundwater and the findings for suitability for industrial purposes are presented.

Key words: Corrosion, Scale forming, Saturation index, Alkalinity, Hardness, Gajwel taluk.

INTRODUCTION

Since the evaluation of chemical quality of groundwater is an important aspect in its utilitarian aspect, the need for geochemical evaluation of ground water resources has gained considerable importance, as the area under investigation is deficit in surface water resources, and also experiences frequent serious water shortage owing to the vagaries of the monsoon.

In the areas, which have limited surface water resources, groundwater assumes greater importance for dependable supplies. But even in productive areas, water supplies are rapidly falling behind the enormous demands of the industry.

It is often said, as if to encourage the hope of increasing our future water resources

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that there is more water within the top half mile of the earth's crust than in all the rivers and lakes combined. Walton, Meyer and Wyrick², Murray and Reeves³, Mc Guinness⁴, and Davis and Dewiest⁵ estimated that the total usable groundwater in storage is of the orders of 10 years annual precipitation or 35 years of run off. Man's reliance on ground water and his continual need to increase tapping ground water is getting greater encouragement day by day because of the non-availability of surface water up to their requirements.

The quality requirements for industrial water supplies range widely and almost every industrial unit has its own standards. Water used by industry can be classified as cooling, boiler and process. Industries frequently suffer from incrustation and corrosion activities which are caused by chemical reactions caused by poor quality of water Anon⁶. The incrustation involves deposition of undesirable minerals, whereas corrosion is a chemical action on metal that results in metal being eaten away.

Study area

The Gajwel taluk forms part of Medak district, which is situated on the western side of Andhra Pradesh in the rain shadow region of the Deccan and semi-arid tracts of Telangana. It lies in between the North latitudes 17° 4 0' 00" to 18° 01' 06" and 78° 52' 45" to 79° 25' 54" East longitudes and fall in SOI topo sheets No. 56 k/5, 6, 9, 10, 13, 14 and 56 J/12 (Fig. 1).

The area is well connected by road as well as rail to all important towns of Andhra Pradesh and other states. The area is at a distance of about 50 kilometers from the capital city of Andhra Pradesh in Hyderabad. The area has gained more importance due to its close proximity to the greater Hyderabad Municipal Corporation (GHMC) and is one of the most potential zones for industrial and as well as domestic. The area experiences semi arid climatic conditions with temperature ranges between 8° C to 45.5° C and the relative humidity varies between 82.8% and 23.4%. The average annual rainfall is 782.46 mm. The area under investigation is a hard rock terrain underlain by crystalline rocks of Archaean age consisting of granites and gneisses. The granites and gneisses are composed essentially of quartz, orthoclase and plagioclase feldspars with accessory minerals like hornblende, biotite and magnetite. Texturally, these rocks are medium to coarse grained and inequigranular. On the basis of colour of the feldspar; granites are classified as pink and grey granites. Numerous dykes, quartz and pegmatite veins of different dimensions are intruded into the country rock. These dykes trend in northeast – southwest direction, whereas quartz veins trend in north - south direction in most of the area. Alluvium is

confined to river and stream courses. The drainage pattern is of dendritic type.



Fig. 1: Location map of Gajwel taluk, Medak Dist. A. P.

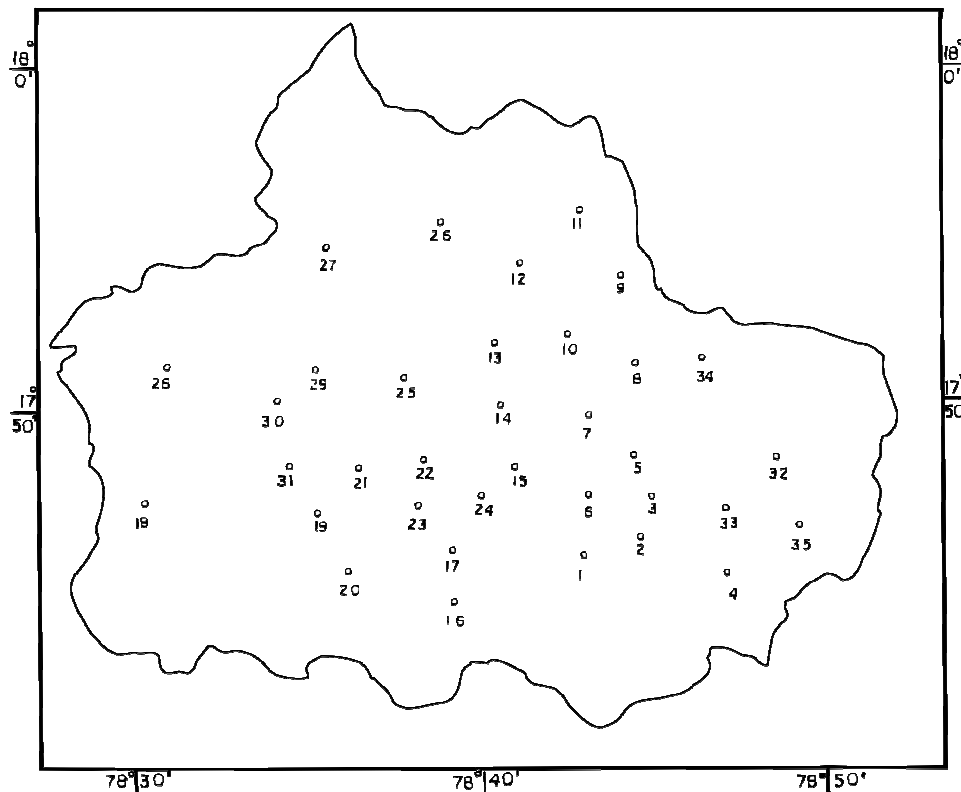


Fig. 2: Location of representative ground water samples

Methodology

The study of chemical quality of water is an important aspect related to various geological investigations. The quality of the groundwater is the resultant of all the processes and reactions that have acted on the water from the moment, it condensed. The chemical composition of groundwater indicates the nature of underground material with which the water has been in contact.

Differences in the chemical quality of water from one place to another reflect variation in nature of aquifers and the medium through which it moved. The mechanism that influences the chemistry of groundwater has been discussed by Conway (1942), Gorhan⁸, Gibbs⁹, Jacks¹⁰, Berner and Berner¹¹, Hem¹², Handa¹³, White¹⁴, Singh and Hasnain^{15, 16}.

The quality of groundwater is of great importance in the suitability for a particular use. In order to understand and evaluate, it is essential to carry out qualitative and quantitative studies before making recommendations on their use. Keeping this in view, an attempt has been made for finding the utilitarian aspects of groundwater for industrial purpose using Langelier saturation index. The socio-economic growth of a region is severely constrained by unavailability of good quality water. In this paper, an attempt has been made to evaluate the present scenario of groundwater quality in the unconfined aquifers of Gajwel taluk. The hydrochemical data relating to the suitability of groundwater for industrial purposes has been evaluated.

35 groundwater samples from different parts of the area under investigation were collected (Fig. 2) and chemically analysed by standard methods those after Brown et al.¹⁷, Rainwater¹⁸, APHA¹⁹. After analysing various chemical parameter values, Langelier saturation index (LSI) was calculated as per Edstrom²¹ and are given in Table 1.

Table 1. Results of chemical analysis (mg/L) of groundwater samples of Gajwel taluk, Andhra Pradesh

Location (Sample No.)	Temp. (°C)	TDS	pH	Alkalinity as CaCO ₃	Hardness Ca ⁺² as CaCO ₃	LSI
Pamalparti (1)	22	320	7.6	275.40	140	- 0.36
Chebarti (2)	22	356	7.9	255.73	71.25	- 0.37
Kishtapuram (3)	21	220	7.2	265.57	116	- 0.83
Itkal (4)	23	440	7.6	265.57	140	- 0.24
Akaram (5)	23	410	7.7	255.73	104	- 0.29
Cheruvupalli (6)	23	456	7.1	383.60	236	- 0.35
Timmaipalli (7)	23	610	7.4	236.06	132	- 0.52
Ramenguda (8)	23	530	7.7	196.72	72	- 0.57
Boragapalli (9)	23	580	7.6	314.75	71.5	- 0.47
Dacharam (10)	23	510	7.4	236.06	128	- 0.54
Ahmadipuum (11)	23	610	7.5	304.91	116	- 0.37
Pirched (12)	23	970	7.6	393.44	108	- 0.21

Cont...

Location (Sample No.)	Temp. (°C)	TDS	pH	Alkalinity as CaCO ₃	Hardness Ca ⁺² as CaCO ₃	LSI
Bayara (13)	23	490	8.1	295.08	40	- 0.27
Gajwel (N-W) (14)	23	440	7.9	245.90	64	- 0.31
Gajwel (South) (15)	23	470	8.2	373.77	104	- 0.01
Mulug (16)	23	590	7.9	413.11	88.5	0.04
Wargal (17)	23	490	7.4	306.55	220	- 0.18
Manoharabad (18)	22	420	7.9	285.24	80	- 0.28
Ambarpet (19)	23	780	7.3	304.91	72	- 0.79
Tuniki Bolaram (20)	23	660	7.5	295.01	220	- 0.12
Madharam (21)	23	440	7.4	304.91	184	- 0.26
Nintur (22)	21	230	7.7	432.78	100	- 0.18
Ramasagarpalli (23)	22	360	7.9	245.90	80	- 0.34
C. K. Mukta (24)	22	410	7.7	295.08	124	- 0.29
Giripalli (25)	23	465	7.9	262.29	54	- 0.36
Kottapalli (26)	23	585	7.9	409.83	88.25	0.04
Indurparial (27)	23	579	7.9	408.19	82.25	0.01
Tupran (28)	22	360	7.8	245.90	77.5	- 0.46
Begamput (29)	21	256	7.3	319.67	80	- 0.82
Nacharam (30)	23	440	7.3	304.91	175	- 0.38
Welur (31)	23	440	7.4	303.27	172.5	- 0.29
Tigula (32)	23	415	7.6	258.19	104.25	- 0.38
Alirajapet (33)	22	335	7.7	267.21	114.75	- 0.36
Kodakandla (34)	23	525	7.7	195.08	70.75	- 0.58
Jagdeopur (35)	22	355	7.6	256.55	71	- 0.68

RESULTS AND DISCUSSION

As the area under investigation is few kilometers away from the Greater Hyderabad

Municipal Corporation (GHMC) and a very potential zone for industrialization; hence, this work has been taken up to know the basic character of groundwater and its utilization aspects for industrial purposes. The present study may be useful in corrosion control and prevention of CaCO_3 scaling in pipes and equipments such as industrial heat exchangers, water heaters, boilers, etc.

Stability indices or saturation indices are used to evaluate the scale forming and scale dissolving tendencies of water. If the saturation index is zero, the water is in equilibrium and there is no net tendency of either scaling or corroding. The positive (+) values of the saturation index indicates the over saturation of water; thus, tendency of CaCO_3 deposition. Water having negative (-) saturation index indicates under saturated and has a tendency to dissolve CaCO_3 and corrosion results.

From the analysed data, it has been found that the 94% of water samples show negative (-) values indicating under saturated and has the ability to dissolve CaCO_3 and have corrosive tendency and 6% of the ground water samples have scale forming tendency.

Out of 94% of corrosive tendency of water samples, according to Carrier²², 76% of them are in the range of slightly corrosive but non scale forming and even the remaining 24% of the samples are in the range of - 0.52 to - 0.83 showing that they are little bit above the slightly corrosive nature. Majority of samples are having less than - 0.25 as LSI and hence, have a very little of corrosive nature.

CONCLUSION

From the present study, it can be concluded that the groundwater samples of Gajwel taluk, Medak district area are having slight corrosive tendency in comparison to scale forming tendency and hence, the groundwater can be used after very mild conventional water treatment processes.

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