

## **A Study of Ground Water quality of Hand pumps situated in the vicinity of Slaughter houses at Aligarh U.P. (India)**

**D.R.Khanna, J.P. Singh\* and Shakun Singh\*\***

Department of Zoology and Environmental Sciences  
Gurukula Kangri Vishwavidyalaya, Haridwar-249404

\*U.P. Pollution Control Board, Aligarh

\*\*Environmental Protection Society, Aligarh

### **Abstract**

A study has been made to assess the water quality of ground water of hand pumps situated around the slaughter houses in respect of physico-chemical characteristics. Samples were collected within the range of 500 meter from the Makhdoomnagar slaughter house situated at Mathura bye pass road, Aligarh and 1km from slaughter house named as M/s- Hind agro industries Ltd., situate towards Anupshahar road, Aligarh. There are two main slaughter houses out of which one is functioning in open area near Makhdoom nagar and other M/s Hind agro industries. Samples were collected from the hand pumps situated around slaughter houses and results of these collected samples revealed that water quality of ground water has been contaminated in most of the hand pumps situated near the slaughter houses in respect of physico- chemical characteristics like colour, pH, conductivity, dissolved solids, hardness, chloride, DO, and BOD. Hence, in the vicinity of these slaughter houses lot of pungent, intolerable, bad odour affects the area up to approximately 5km.

**Key Words:** *Conductivity, TDS, DO, BOD and Hardness*

### **Introduction**

Aligarh city is famous for the lock making industries, door fittings and Aligarh Muslim University. A Mathura bye pass road from Sarsol links to Aligarh Mathura road and a road from Aligarh to Anupshahar goes to Moradabad via Dibai and Narora Atomic Power Plant (NAPP). Aligarh city has mainly two types of communities i.e. Hindus and Muslims having population more than 8 lacs. There is no water supply from surface water sources. So, majority of people use ground water through hand pumps and submersible. In the new developed housing colonies public water distribution system is yet to be laid and hence the residents solely depend upon ground water. The city is yet unsewered. No scientific study of ground water quality has been carried out so far.

A study was conducted to assess the water quality of ground water of hand pumps situated in vicinity of stored effluents of slaughter houses in low lying areas. There are two main slaughter houses out of which one is functioning in open area near Makhdoom nagar situated Mathura bye pass road and other named as M/s- Hind agro industries situated near Central Dairy Farm (CDF) complex about 1 km away from Aligarh- Anup shahar road. In these slaughter houses approximately 2-5 thousand animals are slaughtered daily and their effluents and wastes reach in low lying areas/fields. Although M/s Hind agro industries has well mechanized closed system and established ETP to treat effluent of their industries but due to malfunctioning of ETP and bye pass drainage of effluents generates a bad smell. On the other hand, slaughter house situated near Makhdoom nagar has no mechanized closed system and ETP which creates a lot of pungent, intolerable, bad smell and affects inhabitants badly. Three samples were taken from the hand pumps situated within the range of approximately 500 metre from Makhdoom nagar and four sample from the hand pump situated within the range of about 1 km from m/s Hind agro industries. Number of workers have conducted their studies on water quality of surface and ground water in terms of physico-chemical characteristics (Singh *et al.*, 1988-89, 1991, 1993 and 1994); Soren and Julian, 1977; Mowli and Seshaian, Pande *et al.*, 1979). As far as it is reviewed that no such type of study has been made to assess the water quality of ground water of hand pumps situated near the slaughter houses. Therefore it is

proposed to carry out investigations on water quality of hand pumps in respect of physico- chemical characteristics.

### Materials and methods

The ground water samples were collected in a neat and clean two liter capacity white plastic Jericanes for general parameters and samples for DO were taken in 300 ml capacity borosil glass bottles and DO was fixed by using  $\text{MnSO}_4$  and alkaline azide reagents. Methods of analysis, sampling and preservation of samples were adopted as per standard methods of APHA (1985); Trivedi and Goel, (1984); and Kotiah and Kumaraswamy, (1994).

All the chemicals, reagents, and glasswares were used of A.R. grade and glasswares of borosil make. Instruments related parameters were used of best company make. Parameters studied were colour, odour, pH, conductivity, dissolved solids, DO, BOD, total hardness, Ca/Mg hardness and chloride.

Sampling sites were selected as per following points and map.

1. Hand pump situated just adjacent to Makhdoom nagar slaughter house, Mathura bye pass road, Aligarh. This sampling point is denoted as - (A).
2. Hand pump situated at about 100 metre away from Makhdoom nagar slaughter house, Mathura bye pass road, Aligarh. This sampling point is denoted as -(B).
3. Hand pump situated at about 250 metre away towards Talaspur Khurd village from Makhdoom nagar slaughter house, Mathura bye pass road, Aligarh. This sampling point is denoted as -(C).
4. Hand pump situated in the premises of Central Dairy Farm (CDF) at approximately 200 metre away from M/s Hind agro industries, Anupshahar-road, Aligarh. This sampling point is denoted as -(D).
5. Hand pump situated near police check post at approximately 500 metre away from M/s. Hind agro industries, Anupshahar-road, Aligarh. This sampling point is denoted as-(E).
6. Hand pump situated on road at Chherat approximately 1 km away from M/s Hind agro industries, Anupshahar road, Aligarh. This sampling point is denoted as -(F).
7. Hand pump situated on road of Jamalpur bye pass tiraha near Manjoorgarhi approximately 1km away from m/s Hind agro industries, Anupshahar- road, Aligarh. This sampling point is denoted as -(G).

All these hand pumps have been installed approximately 30-40 feet deep.

### Results and Discussion

Results of ground water quality of hand pumps are given in Table-1 with respect to colour, odour, pH, conductivity, Total Dissolved Solids (TDS). DO, BOD, Total hardness, Ca/Mg hardness and chloride. To compare these characteristics in respect of ground water quality for drinking purposes, prescribed standard limits of BIS-1991 and CPCB-1997 are given in Table-2. As it is evident from the Table-1 that colour noted was straw, light straw, reddish, at sampling points A,B,D,E respectively and unpleasant odour at sampling point A,B,D while at other sampling points colour and odour found normal. The values of the parameters pH, conductivity, TDS, DO, BOD, Hardness and chloride ranged from 7.3-9.3, 0.803-1.96 mmhos/cm, 1107-2209 mg/l, 2.1-6.7 mg/l, 0.9-3.8 mg/l, 295-674 mg/l, 177-387 mg/l, 114-287 mg/l and 86-312 mg/l respectively (Table-2) within the range of study areas. The values of total dissolved solids were found beyond prescribed standards 500 mg/l (Table-2) at all sampling points while the values of pH, Conductivity, BOD, chloride and hardness were observed higher than prescribed standard (BIS, 1991 and CPCB, 1997) at sampling points (A,D, and E); (A,B,D and E); (A); (A,C and E) and (A,B,C,D,E and G,) respectively where as level of Dissolved Oxygen was observed below the standard limit of drinking purposes at all sampling point except

sampling point-G. Minimum DO (2.1)mg/l and maximum values of Biochemical Oxygen Demand (3.8 mg/l); pH(9.3); conductivity (1.96  $\mu$ mhos/cm); TDS (2209mg/l); Total hardness (674mg/l), calcium hardness (387 mg/l),magnesium hardness (287 mg/l)and chloride (312 mg/l), at sampling - A indicates that ground water quality is most polluted which may be due to percolation of stored effluents of slaughter house in low lying areas/fields. The hand pump(sampling -A)is situated adjacent to slaughter house. The values of these characteristics decreases as distances of hand pumps increases from the main sources of effluents of slaughter house. Ground water quality of hand pump (sampling -D ) installed within the premises of M/s- Central Dairy Farm complex is not fit for drinking purposes in respect of pH, conductivity, TDS,DO,Total hardness calcium hardness , magnesium hardness while ground water quality of sampling point-C,F and Cr is some what better as compared to other points on respect of pH, colour, odour, conductivity, DO and BOD. The values of pH of ground water samples are found alkaline in nature at all sampling points.

Presences of BOD almost at all sampling points reveals that the ground water quality upto some extent is being contaminated due to precolation of most polluted stored effluents of slaughter houses which may causes different kinds of diseases to human beings on drinking such contaminated water. Therefore , it is the duty of the concerned authorities to take necessary measures to control further contamination of ground water by such type of water polluting industries.

## References

- APHA-AWWA-WPCF 1985. "Standard methods for the examination for water and waste water"*American Public Health Association*, 16th edition, Washington DC.
- BIS, 1991 and CPCB,1997. "*Drinking water quality standards*". Bureau of Indian Standards, IS: 10500.
- Kotaiah, B.and Kumaraswani, N.1994. *Environmental Enginerring Labortary Manual*, Charotar Publishing House, opposite, Amul dairy, Anand, India. P-115.
- Pande, S.P, Narayanaswamy, V.S. and Hasan, M.Z. 1979. "Quality of well waters of Nagpur with regard to Nitrates, nitrates, nitrities (Phase I)", *Ind. J. Environ. Hlth.* 21 (1) : 35.
- Singh, J.P., Yadava, P.K. and Singh , L.1988. "Pollution Status on Sangam and its adjoining rivers before the Kumbh Mela at Allahabad". *Indian J.Environmental Protection*.8 (11): 839-842.
- Singh,J.P.,Yadava, P.K. and Singh. L.1989. The assessment of water quality of Sangam and its adjoining rivers Ganga and yamuna after Maha Kumbh Mela at a Allahabad". *I.J.E.P* 1(5): 372-375.
- Singh, J.P., Yadava, P.K. and Singh, L. 1989. " Mass bathing effect on water quality of Sangam during Maha Kumbh Mela at Allahabad." *Indian J.Environmental Protection*.9 (3): 189-193.
- Singh, J.P., Yadava, P.K. Singh, Shakun and Prasad, S.C. 1991: "BOD contamination in Kali river at Sadhu at Ashram in Aligarh." *I.J.E.P*1 (5) 325-326.
- Singh,J.P.,Upadhyay, R. and Singh, Shakun. 1994. "A study of water quality of river Yamuna at Agra with special reference to coliform bacteria." *Res.J.PI.ENV*.10: 53-57.
- Singh, J.P., Yadava, P.K., Singh, shakun and Madhu, Joshi 1993. "Assesment of BOD load in River Yamuna in respect of potable water at Agra." *I.J.E.P*13(2): 119-123.
- Soren and Julian 1977. *Ground water quality near the water table in suffolk contury*, Long Island, NewYork "Suffolk country Department of Environemntal Control, *Long Island water resour.Bull*.8:33.
- Trivedi, R.K. and Goel P.K 1984. "*Chemical and Biological methods for water pollution studies*".Karad (India).

**Table 1: Results of Physico-chemical characteristics of ground water quality of hand pumps situated in the vicinity of slaughter houses at Aligarh (U.P.)**

| S. N. o. | Sampling point | Date of Sample Collection | Analysed parameters |             |     |                         |            |           |            |                       |                     |                     |                 |
|----------|----------------|---------------------------|---------------------|-------------|-----|-------------------------|------------|-----------|------------|-----------------------|---------------------|---------------------|-----------------|
|          |                |                           | Colour              | Odour       | pH  | Conductivity (Mmbos/cm) | TDS (mg/l) | DO (mg/l) | BOD (mg/l) | Total hardness (mg/l) | Ca- hardness (mg/l) | Mg- hardness (mg/l) | Chloride (mg/l) |
|          |                |                           |                     |             |     |                         |            |           |            |                       |                     |                     |                 |
| 1.       | A              | 5/06/05                   | Straw               | Unpleasant  | 9.3 | 1.96                    | 2209       | 2.1       | 3.8        | 674                   | 387                 | 287                 | 312             |
| 2.       | B              | 5/06/05                   | Light Straw         | Unpleasant  | 7.7 | 1.33                    | 1874       | 3.2       | 1.8        | 480                   | 290                 | 190                 | 228             |
| 3.       | C              | 5/06/05                   | Colourless          | No-Specific | 7.4 | 0.819                   | 1640       | 4.3       | 1.5        | 329                   | 215                 | 114                 | 276             |
| 4.       | D              | 5/06/05                   | Reddish             | Unpleasant  | 8.7 | 1.93                    | 2166       | 4.1       | 1.4        | 380                   | 258                 | 122                 | 109             |
| 5.       | E              | 5/06/05                   | Light Straw         | No-Specific | 8.6 | 1.88                    | 1832       | 4.8       | 1.6        | 366                   | 184                 | 182                 | 256             |
| 6.       | F              | 5/06/05                   | Colourless          | No-Specific | 7.7 | 0.812                   | 1422       | 5.9       | 1.2        | 295                   | 177                 | 118                 | 86              |
| 7.       | G              | 5/06/05                   | Colourless          | No-Specific | 7.3 | 0.803                   | 1107       | 6.7       | 0.9        | 336                   | 197                 | 139                 | 94              |

**Table 2: Drinking water quality standard- BIS (Bureau of Indian Standard)- IS:10500-1991  
Manual for Water Testing Kit : 1997-CPCB**

| S. No. | Characteristics          | Standard        |
|--------|--------------------------|-----------------|
| 1.     | Colour                   | Colour          |
| 2.     | Odour                    | Unobjectionable |
| 3.     | pH                       | 6.5 - 8.5       |
| 4.     | Conductivity (mmhos/ cm) | 1               |
| 5.     | TDS (mg/l)               | 500             |
| 6.     | DO (mg/l)                | >6              |
| 7.     | BOD (mg/l)               | 2               |
| 8.     | Total hardness (mg/l)    | 300             |
| 9.     | Ca-hardness (mg/l)       | 200             |
| 10.    | Mg-hardness (mg/l)       | 100             |
| 11.    | Chloride (mg/l)          | 250             |

**Figure 1: Map Showing situation of Sampling sites in the vicinity of slaughter house at Aligarh**

