

Evaluation of radiation levels around thermal power station to assess population dose

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Abstract— Systematic studies on the gamma radiation levels were carried out using portable gamma ray survey meter around the thermal plant at Udupi. The Udupi coal based thermal power plant is situated at Nandikoor in Udupi district on the coastal Karnataka. Thermal power stations are the potential sources of radiation hazards to the population living in its vicinity. In view of this, systematic studies on the gamma dose rates were carried out in selected locations around the thermal power station at 1m above from ground level. For each location, many readings were taken and mean value of radiation level was considered as representative level of the location. The measurement were recorded at open, undisturbed, flat ground surfaces free of sheltering and run-off during heavy rain, as well as sites away from open roads and residences. The average gamma dosage rate in air was determined to be 80 nGy/h, with a range of 56 nGy/h to 102 nGy/h. The findings of this comprehensive study are compared to values published in the literature for other parts of the world.

I. INTRODUCTION

Thermal power stations make use of fossil fuel coal to produce electricity. The burning of coal results in fly ash. The coal contains radionuclides of Uranium and Thorium series and the radioactive K-40. These radionuclides, which are present in the majority of coal, are concentrated in fly ash as a result of coal combustion. If the fly ash is redistributed into the environment, that can be a source of radiation risk to the residents live near the thermal power plant. The fly ash can get into the air or it can get into the water bodies, in such case it can be potential source of radiation exposure. In view of this, a detailed survey on the gamma radiation level was employed to determine the gamma dose rates in air around the thermal power plant, UPCL in Udupi district. The outcome of the results are presented in the paper.

II. MATERIALS AND METHODS

A systematic gamma radiation study was conducted around the Udupi Power Corporation Limited (UPCL) thermal power station situated at Nandikoor in Udupi, using a portable gamma ray survey meter. The survey meter used in the present study is Polimaster survey meter (PM1405), which makes use of an energy compensated GM counter as

detector. The study area is located on the coastal Karnataka which is situated in western part of India. The study area lies between 13°14' and 13°59' North latitude and 74°35' and 75°12' East longitude. The gamma dose rate was recorded in selected locations around the thermal power station at 1m above from ground level. For each location, many readings were taken and mean value of radiation level was considered as indicator level of the location. The measurement were recorded at undisturbed surfaces free of sheltering, agricultural activities and sedimentation of waterways during heavy rain, as well as sites away from open roads and residences.

III. RESULTS AND DISCUSSION

The outcome of gamma absorbed dose levels measured in the environs of Udupi Thermal Power Plant are presented in Table 1 and displayed in Fig. 1. The range and average values for the entire region are also provided in the same table. The gamma dose rate in air varies in the range 56 nGy/h to 102 nGy/h with the average value of 80 nGy/h. The gamma dose measurements were carried out around the thermal power station. Dose rate in air near the Nandikur to Mudarangadi (1km surroundings) varies from 56 nGy/h to 96 nGy/h with an average value 77nGy/h.

Table 1 Absorbed Gamma dose rate in air

REGION	Code	Dose rate (nGy/h)
Near Nandikur	A-1	81
Durgapameshwari Temple, Nandikur	A-2	101
Dumavathi Daiva Sthana, Avaralu	A-3	76
Adve	B-1	77
Indian oil, Adve	B-2	63
Palimar	B-3	83
Adve	C-1	69
Shambhavi River, Avaralu	C-2	102
Near to Power Plant	D-1	56
Santhoor	D-2	86
Neechalu	D-3	90
Mudarangadi	E-1	94
Kuthyaru	E-2	79
Shirva	E-3	84
Yelluru	F-1	65
Near Yelluru	F-2	77
Adamaru	G-1	78
Near Adamaru	G-2	67
Near temple, Adamaru	G-3	71
Near Power Plant	H-1	96
Tenka-Admar	H-2	84
Yermal-Tenka	H-3	85
Average		80
Range		102 – 56

Around 3 km surroundings from Adve to Yellur the dose rate varies 63 nGy/h to 102 nGy/h with a average value 82 nGy/h. The surrounding of 6 km, the dose rate at Avaralu to Shirva varies from 71 nGy/h to 90 nGy/h with average value 82 nGy/h. The extent dose rates at Shambhavi River Avaralu, Mudarangadi is expected to the presence of phosphate of thorium existing in the area.

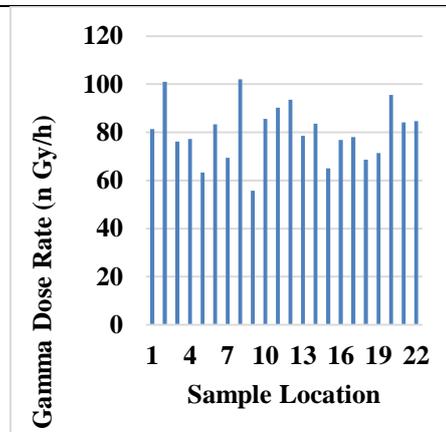

Fig. 1 Variation in Radiation dose measurement (nGy/h)

Table 2 compares the absorbed gamma radiation rate recorded in an Udupi environment to other published values. The gamma dose rates in air in the environment of UPCL was 80 nGy/h. The gamma dosage rates in the air of UPCL's surroundings were 80 nGy/h and in comparison, the Indian average value is 56 nGy/h, while the World average value is 57 nGy/h (UNSCEAR, 2000). The gamma dose levels in environs around the thermal power stations is slightly higher than Indian and World averages.

Table 2 Comparison of absorbed gamma dose rate in air with other environs

Dose Rate (nGy/h)	Region	Reference
80.23	UPCL, Udupi	Present Study
57	World Av	UNSCEAR (2000)
56	Indian Av	UNSCEAR (2000)

IV. CONCLUSIONS

The overall average value of the absorbed gamma dose rates in air surrounding of UPCL are compared to the values of India and world average. The gamma dose rates in environs around the thermal power stations is slightly higher than India and World average values.

REFERENCES

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