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Wind analysis for wind power : Part III

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सार — इस शोध-पत्र में पवन चक्कियों के लिए पवन-ऊर्जा के उपयोग के उद्देश्य से उत्तरी सौराष्ट्र स्थित जाम नगर में पवनों के प्रति घण्टा मानों के बारम्बारता बंटन को चार श्रेणियों, क्षीण, माध्यमिक, शक्तिशाली तथा अति शक्तिशाली में बांटा गया है। इसमें माहवार बारम्बारता बंटन भी प्रस्तुत किया गया है। उत्तरी गुजरात क्षेत्र में अहमदाबाद तथा दक्षिणी गुजरात मै बड़ौदा में किए गए इसी प्रकार के विश्लेषण के परिणामों से उत्तरी सौराष्ट्र के जामनगर में किए गए विश्लेषण के परिणामों का तुलनात्मक अध्ययन भी किया गया है।

ABSTRACT. The paper contains frequency distribution of hourly values of winds of Jamnagar in north Saurashtra in the four ranges, *viz.*, light, moderate, strong and very strong with the objective of utilization of energy from winds for the wind mills. Monthwise frequency distribution is also presented. A comparative study has also been made with the results of similar analyses made earlier in respect of Ahmedabad in the north Gujarat region and Baroda in the south Gujarat region with the present analysis for Jamnagar in north Saurashtra.

1. Introduction

In an earlier communication (Wind analysis for wind power — Part I) the author (Thomas 1981a) has analysed the hourly values if winds at Ahmedabad which is situated in the north Gujarat region for a five-year period 1973-77 and has presented a frequency distribution of hourly values of winds in the four ranges 0-9, 10-14, 15-19 kmph and 20 kmph & above. A monthwise frequency distribution was also presented. In a subsequent communication (Wind analysis for wind power — Part II) the author (Thomas 1981b) has made a similar study in respect of Baroda which is situated in the south Gujarat region. A comparative study of the results of the analysis made for Ahmedabad and the results of the analysis made for Baroda was also presented. In the present paper the author has made a similar study in respect of Jamnagar which is situated in north Saurashtra. Wind data from the Dines Pressure Tube Anemograph records during the five-year period from 1973 to 1977 have been analysed.

The sensor of the Dines Pressure Tube Anemograph is at a height of 13 metres above ground level.

The procedure adopted for the analysis was the same as in the case of the earlier two communications. The types of analysis made were also similar to the earlier communications.

2. Results of analysis

The percentage frequency distribution of winds at Jamnagar is presented in Fig. 1. A monthwise frequency distribution is represented by histograms in Fig. 2.

3. Comparative study

Even as Ahmedabad could be taken as representative of the north Gujarat region and Baroda of the south Gujarat region, Jamnagar could be taken as representative of north Saurashtra. It would, therefore, be worthwhile making a comparative study of the results of the analysis of winds at Ahmedabad and Baroda presented by the author in the earlier papers (Thomas 1981 a & b) and the results of the analysis of winds at Jamnagar presented in this paper. In Fig. 3 is presented histograms of percentage frequencies of winds in the different groups for a year for Jamnagar, Baroda and Ahmedabad given side by side for facilitating comparative study. In Table 1 is presented the monthwise percentage frequency distribution of winds for Jamnagar, Baroda and Ahmedabad. In Fig. 4 is presented histograms of mean number of hours of winds in the different groups for each month for Jamnagar, Baroda and Ahmedabad given side by side for facilitating comparative study.

On a scrutiny of Figs. 3 & 4 and Table 1 the following inferences can be made :

(*i*) Among the three stations Jamnagar, Baroda and Ahmedabad, Jamnagar has the most favourable winds for wind mill operations with 68.9 per cent of the hours in a year having winds of speed above 9 kmph. Ahmedabad ranks second with 56.3 per cent of the hours in a year having winds of speed above 9 kmph. Baroda has the least favourable winds with only 37.2 per cent of the hours in a year having winds of speed above 9 kmph.

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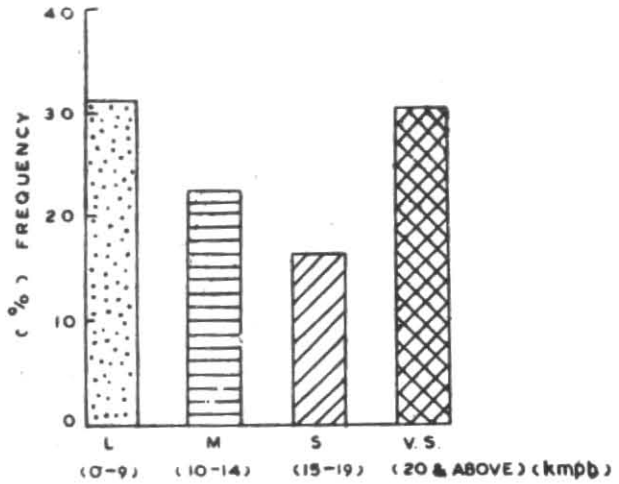

Fig. 1. Percentage frequency

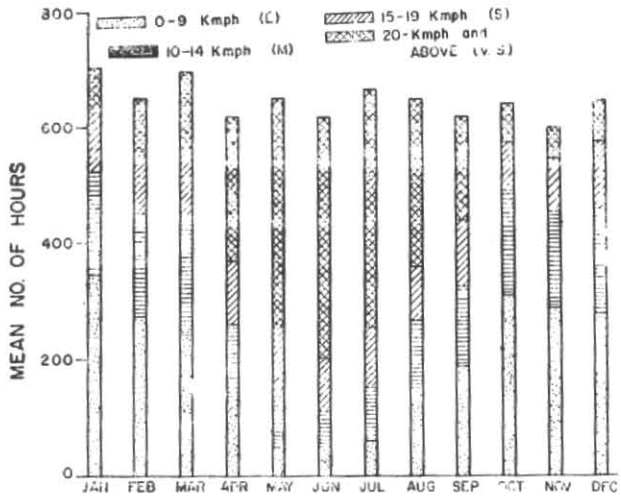

Fig . 2. Histograms of winds : Jamnagar

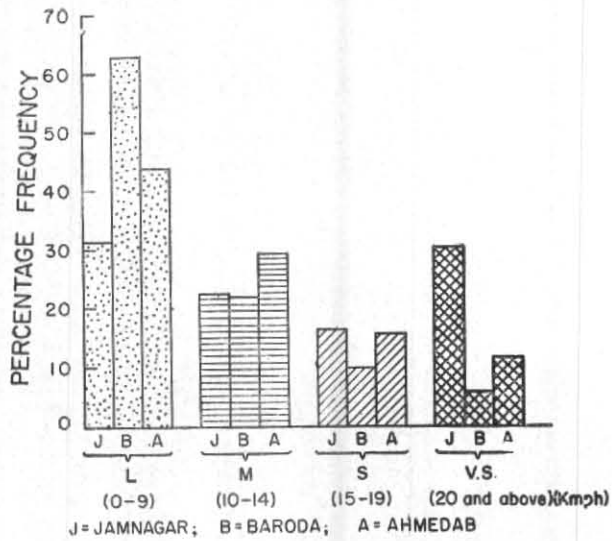

Fig. 3. Comparative study : Percentage frequencies

TABLE 1

Monthwise percentage frequency distribution of winds falling in different groups for Jamnagar, Baroda and Ahmedabad

	Low (0-9 kmph)			Medium (10-14 kmph)			Strong (15-19 kmph)			Very strong (20 kmph and above)		
	JMN (%)	BRD (%)	AHM (%)	JMN (%)	BRD (%)	AHM (%)	JMN (%)	BRD (%)	AHM (%)	JMN %)	BRD (%)	AHM (%)
Jan	49.3	73.2	46.9	25.4	22.5	29.7	14.8	4.2	14.5	10.5	0.2	8.8
Feb	42.4	70.9	38.2	27.3	22.3	34.5	15.7	6.2	15.2	14.5	0.6	12.1
Mar	34.9	72.2	46.8	29.3	21.7	29.1	17.5	5.4	14.4	18.2	0.7	9.7
Apr	21.0	73.6	35.5	21.2	21.2	34.8	17.8	4.4	20.8	40.8	0.8	9.0
May	7.4	42.9	21.7	13.5	21.1	30.8	18.6	18.0	25.6	60.5	18.0	21.9
Jun	8.1	34.4	21.6	9.9	22.9	26.1	14.9	19.6	23.7	67.2	23.1	28.5
Jul	9.0	39.9	35.9	13.9	25.3	33.8	15.6	20.7	17.5	61.5	14.1	12.8
Aug	23.4	48.6	41.9	18.0	28.4	31.1	14.2	15.8	17.8	44.4	7.2	9.2
Sep	30.5	71.6	49.1	22.3	17.1	31.9	18.4	8.4	12.4	28.8	2.9	6.6
Oct	49.4	87.2	63.2	28.5	10.1	23.1	13.3	2.4	8.8	8.9	0.4	4.9
Nov	48.2	77.9	65.5	27.8	15.9	21.3	15.3	5.9	7.5	8.7	0.4	5.7
Dec	43.2	64.0	56.0	27.8	30.8	25.3	18.1	5.0	12.1	11.0	0.2	6.7

N.B. : JMN—Jamnagar; BRD—Baroda; AHM—Ahmedabad

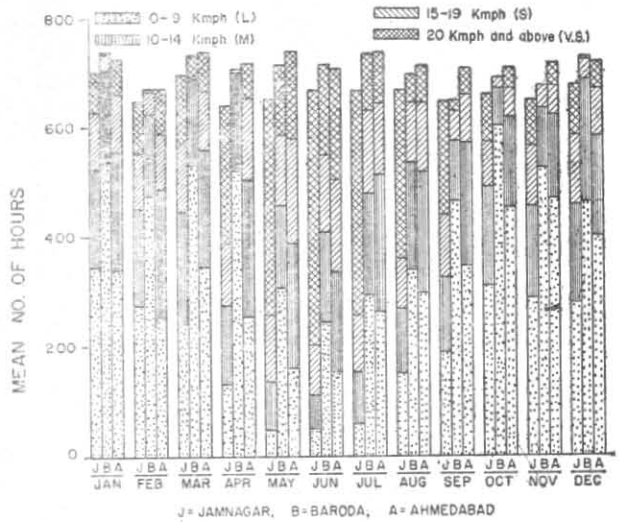

Fig. 4. Comparative study : No. of hours in a month

(*ii*) If we consider the medium winds (10-14 kmph) they have the lowest percentage frequency during June in Jamnagar, during October in Baroda and during November in Ahmedabad. They have the highest percentage frequency during March in Jamnagar, during December in Baroda and during April in Ahmedabad.

(*iii*) If we consider the strong winds (15-19 kmph) they have the lowest percentage frequency during October in Jamnagar and Baroda and during November in Ahmedabad. They have the highest percentage frequency during May in Jamnagar and Ahmedabad and during July in Baroda.

(*iv*) If we consider the very strong winds (20 kmph and above) they have the lowest percentage frequency during November in Jamnagar, during December as well as January in Baroda and during October in Ahmedabad. They have the highest percentage frequency during June in all the three places.

(*v*) Taking that the wind mills can be operated when the winds are above 9 kmph, in Jamnagar, May is the most favourable month for wind mill operation and October is the least favourable month. In Baroda, June is the most favourable month and October the least favourable month. In Ahmedabad, June is the most favourable month and November the least favourable month.

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