Accident Analysis and Modeling on NH-55(India)

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Abstract: *According to MORTH-2013 India has the highest no of accidents in the World. Accident Severity has been increasing year by year. Hence Road Safety is a major concern. A case study was taken on NH-55 which connects to various major industries and mines. The study shows that major cases of fatalities are due to trucks. The main cause of accidents are due to high density, non restriction of speed, On street parking, shoulder drop-off, edge drop, old girth trees on shoulder, visibility restriction etc. Detail analysis and preventive measures are discussed in this paper.*
Keywords: *Accidents, Fatalities, MORTH, Road Safety.*

I.   INTRODUCTION

Road safety is one of the most important problems in our society. Every year 1.2 million of people are killed and between 20 and 50 million people are injured in road accidents. If current trends continue road traffic accidents are predicted to be third leading contributor to the global burden of Disease and injury by 2020 (Torregrosa et al.,2012)India had earned the dubious distinction of having more number of fatalities due to road   accidents in the world. Road safety is emerging as a major social concern around the world especially in India. India had earned the dubious distinction of having more number of fatalities due to road   accidents in the world. Road safety is emerging as a major social concern around the world especially in India (Shiv kumar and Krishnaraj,2012).

The various causes of accidents may be due to three factors shown in fig 1.
(i) Driver
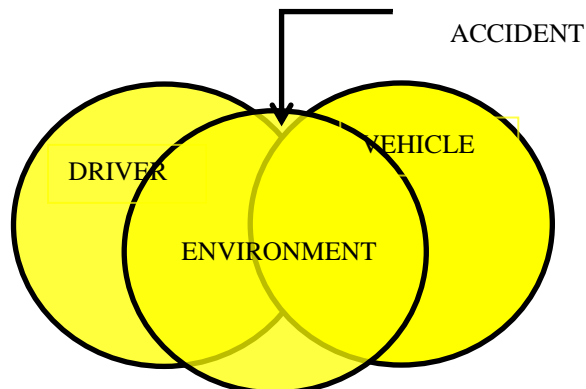(ii)Vehicle
(iii) Road Environment

Fig1. Causes of Accident

II.   NEED AND OBJECTIVES OF STUDY

The major objectives of the present work are listed below
(i)To study the hourly, monthly and annual variation in accident rate on selected stretch of
two-lane national highway.
(ii)To study the effect of traffic volume, Density and capacity on accident rate on
two-lane national highway.
(iii)To study the maintainance of road surface and shoulder on rate of accident
(iv)To develop an accident prediction model based on Density and road condition

III.   STUDY STRETCH AND DATA COLLECTION

The study stretch was selected fromchainage Km157/0 to Km 159/0 on NH-55 which connects Angul to Bhushan plant in Orissa state.The accidents data were collected from three police station named Angul,Nalco,Banarpal with prior permission of supertindent police angul and traffic datas from executive engineer office Dhenkanal.

The study stretch was divided into Five equal stretches of each 5Km length.The Study Stretch is shown in Fig2The accident datas are shown in shown in fig
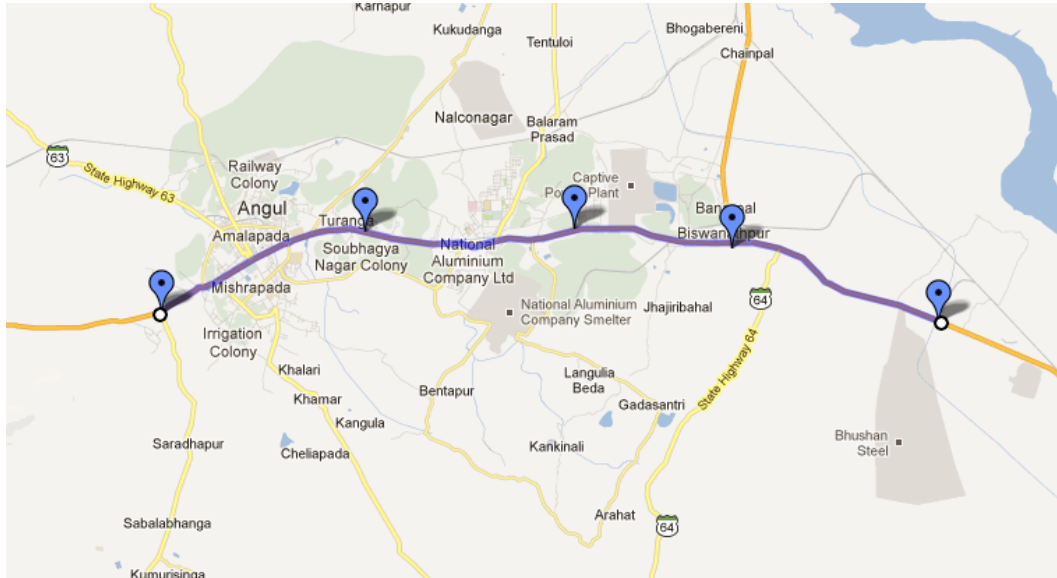

Fig.2 Study StretchSource:Google Map

IV.   ACCIDENT DATA

The accident data collected during last 10 years were plotted with MS excel.Total no of accidents,fatalities,injuries are shown in Table 1 and figs 3-6 of various stretches.

TABLE 1 Accident Data during 2002-2011

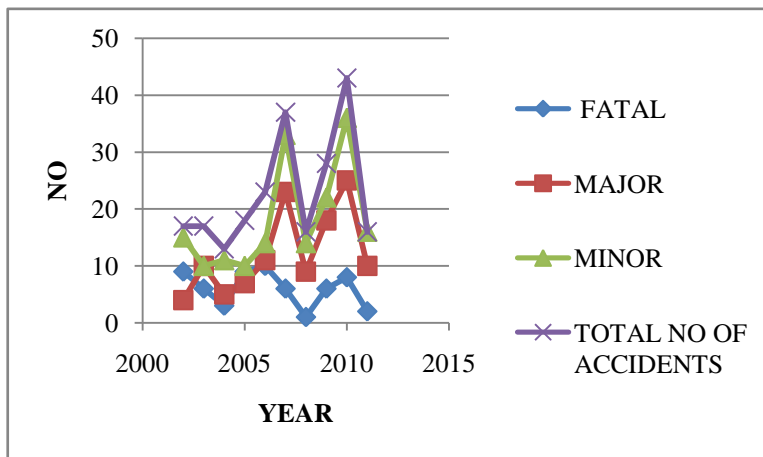| Year	Total Accident	Fatal	Major injury	Minor injury
2002	47	15	16	37
2004	62	16	25	45
2005	53	20	32	39
2003	58	11	35	50
2008	66	4	24	61
2006	105	21	34	40
2011	62	11	30	58
2010	95	18	34	84
2009	86	13	32	81
2007	67	18	41	84

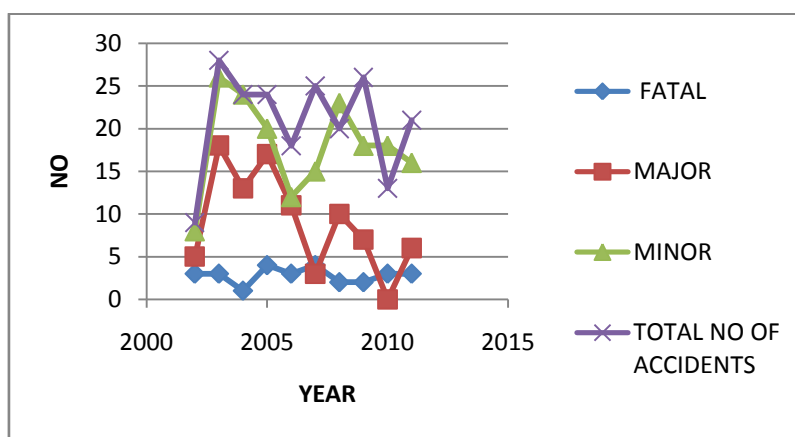**Fig.3 Annual Variation in Accidents of Stretch-1**

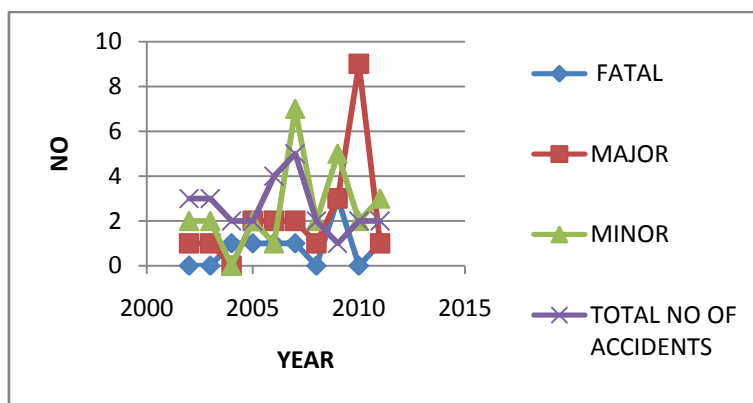**Fig.4 Annual Variation in Accidents of Stretch-1**

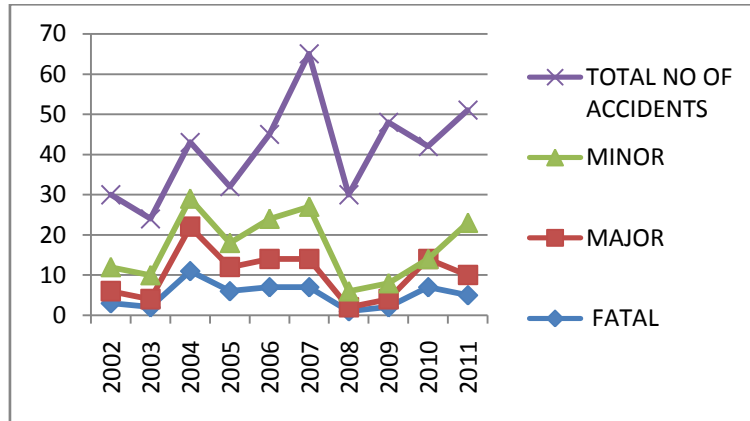**Fig.5 Annual Variation in Accidents of Stretch-1**

Fig.6 Annual Variation in Accidents of Stretch-4

V.   MONTHLY VARIATION IN ACCIDENTS

 Fig. 7 shows the monthly variation in accidents.peak accident occurs in summer season i.e in the month of march,april and may.This is due to distraction related to environment.Problem in these months are glare,fatigue, inconvienient heat.
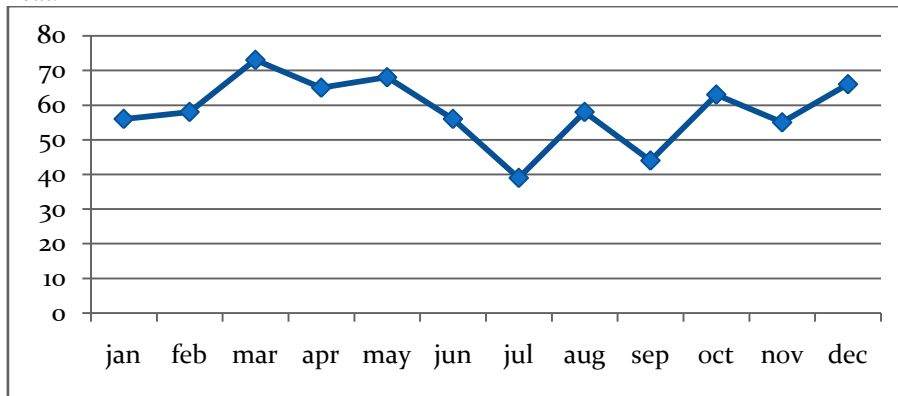

Fig.7 Accident month wise(2002-2011)

VI.   HOURLY VARIATION IN ACCIDENTS

Fig. 8 shows hourly variation in accidents.One can observe more accidents occurs in between 8PM to 9PM.In this hour line truck(Truck Series) start their long journey.Most of the driver do not use speedometer as they drive by approximation.Speed crosses limiting speed as a result accident occur.Also they drink and drive in the evening hour.In the late night they use marijjuana as a result reaction time increases and loss of contro occurs.Some drivers make the vehicle over load.In india load capacity is 10 tonne or 16.2 tonne for goods carriage but they carry more than that results uncontrol and leads to accidents.
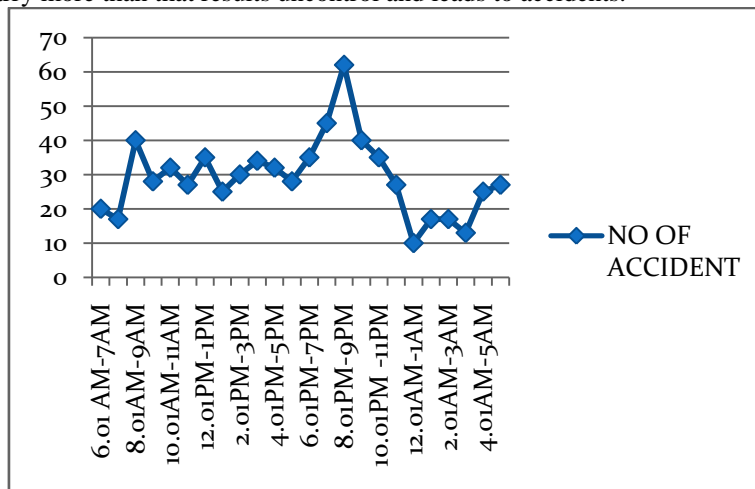

Fig.8 Accident time wise(2002-2011)

VII.   VEHICLES INVOLVED IN FATALITIES

Vehicle user related to fatalities during 2002-2011 are shown in pie chart in percent. The results indicate that 60 percent of fatalities are due to truck drivers followed by 25 percent by unknown driver,7 percent by motor cycles,5 percent by car and jeep,3percent by bus respectively as shown in fig. 9.They consume alcohol and drugs in long driving. As a result reaction time increases and loss of control occurs during speed driving leads to fatalities
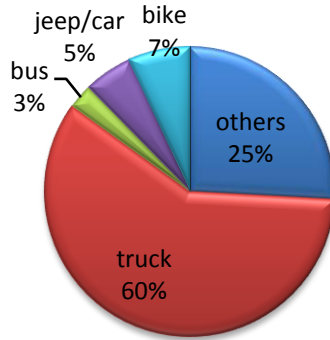

Fig.9 Vehicle involved in fatalities during(2002-2011)

VIII.   TRAFFIC DATA

Traffic Datas were collected from PWD office.Different values of ADT (Volume), K (Density) and U(speed) for four stretches are shown in Table.It follows a relationship Q = U x K .From the below observation it clearly indicates that capacity(Q_{max}) exceeds for a two lane highway as per IRC-106.Hence it is necessary to increase lanewidth that is the road should be converted into four lane.Datas of four stretches are shown in Table 2.

TABLE 2 Traffic Data

STRETCH-1	STRETCH-2	STRETCH-3	STRETCH-4
ADT = 63600	ADT = 32160	ADT = 32160	ADT = 48960
Q_{MAX} =0.8 pcu/s	Q_{MAX} =0.74pcu/s	Q_{MAX} =0.74 pcu/s	Q_{MAX} =0.92pcu/s
$K_{MEAN=}$ 0.11358pcu/m	K_{MEAN}=0.107pcu/m	$K_{MEAN=}$ 0.085pcu/m	K_{MEAN}=0.128pcu/m
$U_{MEAN=}$6.16 m/s	$U_{MEAN=}$6.73 m/s	$U_{MEAN=}$6.32m/s	$U_{MEAN=}$6.32 m/s

IX.   ACCIDENT PREDICTION MODEL

The accident per year was regressed with Densityand Road side features. The general form of equation is represented as

No of accident = 48.599 x density+ No of Trees on Shoulder   x 0.7 + No of curves x 4.998-8.914x shoulder condition.

The above equation shows that accidents increases with increasing in density,no of trees on shoulder and no of curves.The accident decreases with increase in shoulder condition.Hence regular maintainance of road should be done , old girth trees should be removed and widening of lane should be done by making into four lane.

X.   CONCLUSION

Stretch IV has the highest no of accidents which accounts for 34.1% of total accidents. Stretch I has the second highest no of accidents accounts for 32.5% of total accident No of accidents in stretch II accounts for 29.6% of total accidents. Stretch III has minimum no of accidents accounts for 3.7% of total accidents The accident rate can be decreased by road side clearance, proper maintenance of shoulders, lighting, and junction improvement. Speed limit should be brought down by providing humps near accident spots. Sight distance near curves should be obstruction free.

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