



A STUDY OF CURRENT METHOD FOR LOGGING OF INDUSTRIAL ACCIDENTS' DATA, FURTHER TREND ANALYSIS AND PROPOSAL ON THE USE OF DIGITAL MEDIUM FOR REAL-TIME MONITORING OF INDUSTRIAL ACCIDENTS IN GUJARAT, INDIA

Harshil Jashapara, Process Engineer, PRORENER Engineering Consultants Pvt. Ltd., Ahmedabad, Gujarat, India. Email: harshil.jashapara@prorener.com

Jeet Fultariya, Process Engineer, PRORENER Engineering Consultants Pvt. Ltd., Ahmedabad, Gujarat, India. Email: jeet.fultariya@prorener.com

Meet Dadhania, Process Engineer, PRORENER Engineering Consultants Pvt. Ltd., Ahmedabad, Gujarat, India. Email: meet.dadhania@prorener.com

Akhilesh Shah, Principal Consultant, PRORENER Engineering Consultants Pvt. Ltd., Ahmedabad, Gujarat, India. Email: akhilesh.shah@prorener.com

Abstract

Gujarat is a highly industrialized state of India. More than 50 different kinds of industries are listed in the state, which amounts to humongous workforce involved in variety of hazardous activities as part of daily routine. Since, hazard is inherent part of such industry, obviously industrial accidents are also frequent. Indian government has formed a body called Director Industrial Safety and Health (DISH), under Labour and Employment department, which collects, maintains and analyze industrial accident data in each state. The district offices of this body interface directly with the industry and are primary source of data collection. This paper highlights the extant method of data collection, record and publication by these offices. Moreover, it also highlights various gaps in this entire process. It is found that for variety of reasons there have been anomalies in reporting, collecting, and publishing accident-related information. Hence, the paper has also proposed a method which addresses these gaps and can provide a reliable means for data logging and trend analysis.

The paper also reflects upon the trend in the industrial accidents leading to injuries and fatalities between 2012 to 2021. The analysis is focused on data from top 5-7 industry types with highest number of accident occurrences and causes responsible for accidents. The analysis also highlights frequency of accidents by particular industry segment and particular cause in between year 2012 and 2021.

Keywords : Industrial accidents, Inconsistance data collection, Data discrepancy, Trend analysis of historical accident data, Digital reporting method

1. Introduction

Gujarat is amongst the most industrialized state in the country. The bulk of state's industries are related to chemical processing units and energy sector. By virtue of the hazardous processes involved in these sectors, industrial accidents have been commonplace. However, apart from these types of industries, there are substantial amount of non-energy industrial units which also contributes to industrial hazardous events. About 1/3rd of the factories registered in the state are involved in hazardous work processes FAS report sent to DGFASLI in 2021[1]. Theoretically, the recording of industrial accidents in non-energy industries is quite structured and organized through government body, Director Industrial Safety and Health (DISH) and monitored by Directorate General Factory Advise Service & Labor Institute (DGFASLI), Ministry of labor and employment. There are a total 19 district DISH offices in the Gujarat divided into the four regions: Ahmedabad, Rajkot, Vadodara, and Surat [1]. The DISH Head office of Gujarat state is in Khanpur, Ahmedabad.

The arrangement is shown in Table 1[1].



Table 1: Structure of DISH offices in Gujarat

Serial. no.	Regional DISH offices	District DISH offices
1	Ahmedabad	Ahmedabad
		Gandhinagar
		Mehsana
2	Baroda	Baroda
		Kheda (Nadiad)
		Anand
		Godhra
3	Rajkot	Rajkot
		Adipur-Kutch
		Junagadh
		Bhavnagar
		Jamnagar
		Alang
		Surendra Nagar
4	Surat	Morbi
		Surat
		Bharuch
		Navsari
		Valsad

1.1 Process of data collection:

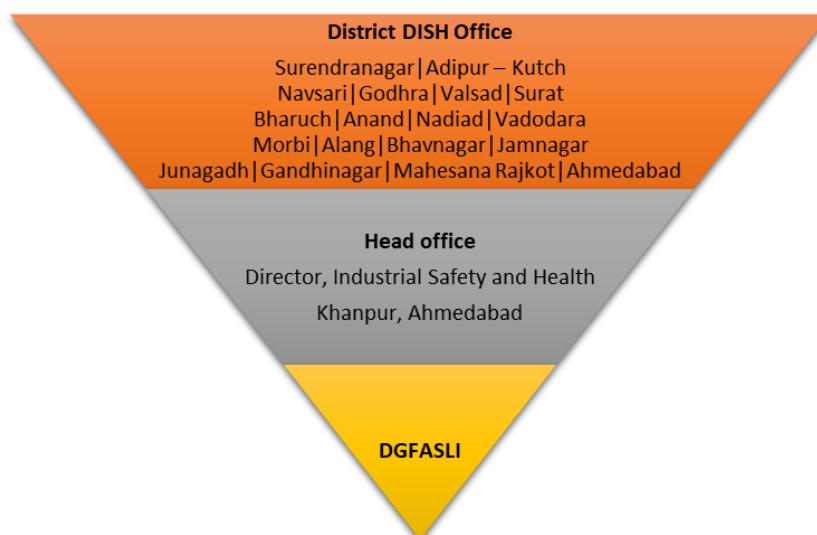




Figure 1 shows flow of data from district to the central authority. The information flow is quite straightforward as explained by DISH [5]. The industrial unit have to inform about the accident by filling a form available with the district DISH office. Thereby, verification is performed by the DISH officer and once satisfied, then the information is sent to the DISH head office. The state head office of DISH assimilates data from all district and publish a yearly record of accidents on its website by 31st August. Parallely, same information is made available to central authority DGFASLI.

Data is classified for total of 51 different types of industry and, a total of 15 types of causes by district offices. However, the DISH head office summarizes the data from all districts and publishes an annual consolidated report to DGFASLI. Various industries and different causes of accidents throughout the year are listed in these published data along with the total number of accidents that took place in that year.

Since, the data logging is entirely manual, as part of the study, RTIs were sent to each of the district office to get the raw data. Besides, consolidated data from the DISH head office website was used to compare the received data from the district offices.

1.2 Findings

In Gujarat the whole process of industrial data collection and data entry is offline and manual. So that there is always a chance for human error in data entry [5]. Upon comparison of raw data with the actual published data in the website, following were the discrepancies that emerged:

- a) Non availability of accident data at 12 district DISH office [Table 2 & Table 3].
- b) Data mismatch between industry wise and cause wise data at district level [Table 4 ,5 ,6 ,7 ,8 , 9].
- c) The basis of data consolidation of entire state by head office of Gujarat even if some district DISH offices doesn't have record of accident data.

2. Study Methodology

Following steps were followed to analyze the existing accident reporting system for industries:

- 1. RTIs were sent to all district DISH offices and head office at Ahmedabad to gather the raw data from the industries for previous 10 years i.e., 2012 to 2021.
- 2. Segregate data, district-wise and industry-wise.
- 3. Identify discrepancy in the collected data.
- 4. Select top five industry and causes based on accident frequency.
- 5. Represent the data graphically for trend analysis
- 6. Analyze findings and propose method for improvement.

3. Results and Discussion

3.1 Results and discussion for data discrepancy

The findings of the analysis are shown in below tables. The data reflects following

- 1. Highlights offices that were unable to provide the data during the time period.
- 2. District-wise number of incidents
- 3. District-wise number of injuries
- 4. District-wise number of fatalities

Table 2 & Table 3 below highlights DISH offices that were not able to provide the data.

Table 2: Data Received by District DISH offices (2012-2017) (RTI, DISH Offices, 2012 to 2017) [2]

Sr No.	DISH Office	2012		2013		2014		2015		2016		2017	
		Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
1.	Ahmedabad	x	x	x	x	x	x	x	x	x	x	x	x



Sr No.	DISH Office	2012		2013		2014		2015		2016		2017	
		Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
2.	Gandhinagar	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
3.	Mehsana	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
4.	Vadodara	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5.	Nadiad	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6.	Godhra	✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✗	✓
7.	Anand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8.	Rajkot	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
9.	Adipur-Kutch	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
10.	Junagadh	✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✗	✓
11.	Bhavnagar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12.	Alang	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
13.	Jamnagar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
14.	Surendra Nagar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
15.	Morbi	✗	✗	✗	✗	✗	✗	✓	✗	✓	✗	✗	✗
16.	Surat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
17.	Bharuch	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
18.	Navsari	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
19.	Valsad	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ - indicates data received from DISH office
 ✗ - indicates data not received from DISH office

As shown in Table 2, a total of 10 DISH offices i.e. Ahmedabad, Gandhinagar, Mehsana, Vadodara, Nadiad, Godhra, Rajkot, Adipur, Junagadh, and Morbi were not able to provide data for multiple years
 Table 3: Data Received by District DISH offices (2018-2021) (RTI, DISH Offices, 2018 to 2021) [3]

Sr No.	DISH Office	2018		2019		2020		2021	
		Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
1	Ahmedabad	✓	✓	✓	✓	✓	✓	✓	✓



Sr No.	DISH Office	2018		2019		2020		2021	
		Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
2	Gandhinagar	✓	✓	✓	✓	✓	✓	✓	✓
3	Mehsana	✓	✓	✓	✓	✓	✓	✓	✓
4	Vadodara	✓	✓	✓	✓	✓	✓	✓	✓
5	Nadiad	✓	✓	✓	✓	✓	✓	✓	✓
6	Godhra	✓	✓	✓	✓	✓	✓	✓	✓
7	Anand	✓	✓	✓	✓	✓	✓	✓	✓
8	Rajkot	✓	✓	✓	✓	✓	✓	✓	✓
9	Adipur-Kutch	✓	✓	✓	✓	✓	✓	✓	✓
10	Junagadh	✓	✓	✓	✓	✓	✓	✓	✓
11	Bhavnagar	✓	✓	✓	✓	✓	✓	✓	✓
12	Alang	✓	✓	✓	✓	✓	✓	✓	✓
13	Jamnagar	✓	✓	✓	✓	✓	✓	✓	✓
14	Surendra Nagar	✓	✓	✓	✓	✓	✓	✓	✓
15	Morbi	✓	✓	✓	✓	✓	✓	✓	✓
16	Surat	✓	✓	✓	✓	✓	✓	✓	✓
17	Bharuch	✗	✓	✓	✓	✓	✓	✓	✓
18	Navsari	✓	✓	✓	✓	✓	✓	✓	✓
19	Valsad	✗	✗	✗	✗	✗	✗	✗	✗

✓ - indicates data received from DISH office

✗ - indicates data not received from DISH office

As shown in Table 3, Valsad and Bharuch offices were not able to provide complete data for multiple years.

District DISH office classify the raw data of accidents, industry-wise and cause-wise [see Figure 2 & 3].

Yearly statement of Fatal and Non-Fatal Injuries and Dangerous Occurrence Industry wise
State: Gujarat 2014

Sr. No.	Code No. (As per NIC 1998)	Industry	No. of Dangerous Occurrence with / without Injuries	No. of Fatal Injuries	No. of non-Fatal Injuries
1	1	Agriculture and Animal Husbandry Services	-	-	-
2		Mining of coal and lignite extraction of peat	-	-	1
3		Mfg. Of Food Products and Beverages	-	-	-
4		Mfg. Of Tobacco Products	-	-	1
5		Mfg. Of Textile	-	2	-
6		Mfg. Of Wood and Products Wood and Cork	-	-	-
7		Mfg. Of Paper and Paper Products	-	-	2
8		Publishing, Printing and Proof recorded Media	-	-	-
9		Mfg. Of Crude Refined Petro Products and N. Fuel	12	30	76
10		Mfg. Of Chemicals and Chemical Products	-	-	-
11		Mfg. Of Rubber and Plastics Products	-	-	-
12		Mfg. Of Other Non-Metallic Mineral Products	-	-	-
13		Mfg. Of Basic Metals	-	-	-
14		Mfg. Of Fabricated Metal Products	-	-	-
15		Mfg. Of Machinery and Equipment n.e.c	-	1	-
16		Mfg. Of Electrical Machinery and Apparatus	-	-	-
17		Mfg. Of Motor Vehicles Trainers and Semi	-	-	-
18		Mfg. Of Transport Equipment	-	-	-
19		Electricity Gas Steam and Hot Water Supply	-	-	-
20		Safe, Maintenance and Repair of Motor Vehicles	-	-	-
21		Repair of Personal and Household Goods	-	-	-
22		Land Transport, Transport Via Pipeline	-	-	-
23		Suppo and Auxillary Transport Activities	-	-	-
24		Extraction of Petro and Gas	1	3	15
25		Other	1	3	15
		Total	13	36	95

Note:- (1) Injuries to be included here are those which are reportable under Section 88 of the Factories Act.
(2) Dangerous occurrence means any fire, explosion, gas leak, bursting of vessel etc. reportable under Section 88 A of the Factories Act

Figure 2: Industry wise data received by DISH office

YEARLY STATEMENT OF FATAL AND NON-FATAL INJURIES AND DANGEROUS OCCURRENCES CAUSEWISE
FAS-III B

Sr.no.	District	Causation	YEAR-2014		
			No of dangerous occurrences with / without injuries	No of Fatal Injuries	No of Non-Fatal Injuries
1		2	3	4	5
1		Prime Movers (101)	0	0	0
2		Machinery moved by mechanical power(102 to 112)	0	0	0
3		Machinery not moved by mechanical power(122 & 123)	0	0	0
4		Transport (113 to 116)	0	0	0
5		Electricity (117)	0	0	0
6		Explosion (118)	2	14	25
7		Fire (119)	31	4	15
8		Gassing (120)	0	12	35
9		Molten and other or Corrosive substances (121)	0	0	0
10		Hand tools (124)	0	0	0
11		Struck by falling bodies (125)	0	0	0
12		Persons falling (126 to 128)	0	0	0
13		Stepping on or striking against objects (129)	0	0	0
14		Handling goods (130)	0	0	0
15		Others (131)	0	6	20
		Total	33	36	95

Note:- 1) Injuries to be included here are those which are reportable under Section 88 of the Factories Act.
2) Dangerous occurrence means any fire, explosion, gas leak, bursting of vessel etc. reportable under Section 88 A of the Factories Act
3) Strike out whichever is not applicable.
4) In column 2 the figures given in bracket indicate the code number of causes.

Figure 3: Cause wise data received by DISH office

This classification is done based on NIC code 1998 & 2008. It is found that all district offices do not uniformly follow the latest NIC code 2008. Moreover, the numerical value for Industry-wise number of injuries and cause-wise number of injuries also does not match for many offices [Table 4,5,6,7,8,9]. The tables also highlight DISH offices that have not provided data in response to RTI.

Table 4: Data discrepancy in No. of dangerous occurrence with/without injuries (2012-2016) (RTI, DISH Offices, 2012 to 2017) [2]

District	No. of dangerous occurrence with/without injuries									
	2012		2013		2014		2015		2016	
	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
Bharuch	1	0	0	0	13	33	18	18	23	23
Bhavnagar	0	0	0	0	0	0	0	0	0	0
Gandhinagar	*	*	*	*	*	*	*	*	*	*
Morbi	*	*	*	*	*	*	0	*	0	*
Surendra Nagar	0	0	0	0	0	0	0	0	2	2
Vadodara	*	*	0	0	0	0	0	0	0	0

Mehsana	*	*	*	*	*	*	*	*	*	*
Valsad	0	0	0	0	0	0	0	0	0	0
Ahmedabad	*	*	*	*	*	*	*	*	*	*

* - indicates data not received from DISH office

*Red font indicates data discrepancy of injuries between industry wise and cause wise

Table 4 shows that Bharuch office has data discrepancy for years 2012 and 2014.

Table 5 : Data discrepancy in No. of dangerous occurrence with/without injuries (2017-2021) (RTI, DISH Offices, 2012 to 2017) (RTI, DISH Offices, 2018 to 2021) [2] [3]

District	No. of dangerous occurrence with/without injuries									
	2017		2018		2019		2020		2021	
	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
Bharuch	16	16	*	28	28	28	158	25	139	139
Bhavnagar	0	0	0	0	21	21	19	19	32	32
Gandhinagar	*	*	0	0	0	0	1	1	6	6
Morbi	*	*	4	0	0	0	3	3	1	1
Surendranagar	1	1	5	5	2	2	2	2	2	2
Vadodara	0	0	0	0	10	0	0	0	114	114
Mehsana	*	*	1	1	0	0	0	0	0	0
Valsad	0	0	*	*	*	*	*	*	*	*
Ahmedabad	*	*	47	47	56	56	17	17	7	7

Table 5 shows Bharuch office has data discrepancy for years 2020, Morbi office for year 2018 and Vadodara office for year 2019.

Table 6 : Data discrepancy in No. of non-fatal injuries (2012-2016 (RTI, DISH Offices, 2012 to 2017)) [2]

District	No. of non-fatal injuries									
	2012		2013		2014		2015		2016	
	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
Bharuch	158	48	107	60	95	95	108	111	124	124
Bhavnagar	21	17	19	20	19	19	12	11	16	16
Gandhinagar	*	*	*	*	*	*	*	*	*	*
Morbi	*	*	*	*	*	*	22	*	0	*
Surendranagar	393	393	105	105	35	36	33	33	5	5
Vadodara	*	*	281	281	215	215	233	233	150	150
Mehsana	*	*	*	*	*	*	*	*	*	*
Valsad	52	55	1	1	31	31	10	29	19	19
Ahmedabad	*	*	*	*	*	*	*	*	*	*

Table 6 shows Bharuch office has data discrepancy for year 2012,2013 and 2015, Bhavnagar office for year 2012,2013 and 2015, Surendranagar office for year 2014, Valsad office for year 2012.

Table 7: Data discrepancy in No. of non-fatal injuries (2017-2021) (RTI, DISH Offices, 2012 to 2017) (RTI, DISH Offices, 2018 to 2021) [2] [3]

District	No. of non-fatal injuries									
	2017		2018		2019		2020		2021	
	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
Bharuch	130	130	*	145	113	113	128	128	139	139

Bhavnagar	13	13	14	14	14	14	17	17	10	22
Gandhinagar	*	*	3	2	10	10	19	19	11	21
Morbi	*	*	3	3	5	5	1	1	0	0
Surendranagar	6	6	1	1	0	0	0	0	2	2
Vadodara	92	92	149	149	78	78	88	88	107	107
Mehsana	*	*	77	5	0	0	0	0	0	0
Valsad	57	57	*	*	*	*	*	*	*	*
Ahmedabad	*	*	42	42	39	39	12	12	19	19

Table 7 shows Gandhinagar office has data discrepancy for year 2018, Mehsana office for year 2018.

Table 8: Data discrepancy in No. of fatal injuries (2012-2016 (RTI, DISH Offices, 2012 to 2017)) [2]

District	No. of fatal injuries									
	2012		2013		2014		2015		2016	
	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
Bharuch	24	32	25	36	36	36	26	26	36	36
Bhavnagar	3	3	4	0	2	2	2	2	10	10
Gandhinagar	*	*	*	*	*	*	*	*	*	*
Morbi	*	*	*	*	*	*	14	*	28	*
Surendranagar	3	3	1	1	2	2	1	1	1	1
Vadodara	*	*	2	2	0	0	1	1	1	1
Mehsana	*	*	*	*	*	*	*	*	*	*
Valsad	57	57	0	0	16	16	10	29	47	47
Ahmedabad	*	*	*	*	*	*	*	*	*	*

Table 8 shows Bharuch office has data discrepancy for year 2012 and 2013, Bhavnagar office for year 2013.

Table 9: Data discrepancy in No. of fatal injuries (2017-2021) (RTI, DISH Offices, 2012 to 2017) (RTI, DISH Offices, 2018 to 2021) [2] [3]

District	No. of fatal injuries									
	2017		2018		2019		2020		2021	
	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise	Industry Wise	Cause Wise
Bharuch	16	16	*	28	28	28	43	43	29	29
Bhavnagar	5	6	6	6	7	7	2	2	10	22
Gandhinagar	*	*	14	9	13	13	5	5	11	21
Morbi	*	*	34	34	35	35	22	22	13	13
Surendranagar	0	0	4	4	2	2	1	1	0	0
Vadodara	7	7	19	19	14	14	12	12	20	20
Mehsana	*	*	4	4	1	1	6	6	14	14
Valsad	21	21	*	*	*	*	*	*	*	*
Ahmedabad	*	*	5	4	14	14	5	5	10	10

Table 9 shows Bhavnagar office has data discrepancy for year 2017, Gandhinagar office for year 2018. The discrepancies shown in above tables demonstrates the intrinsic drawback in the manual nature of data collection. These errors have been prevalent over the years and it may be due to the following reasons:

- Typos and misprints during recording,
- Inconsistent formats used by industry and dish office,
- Lack of data entry guidelines or guidelines not followed,

- Delay/failure to capture information at the time of incidents,
- Lack of internal quality control (QC) check for error detection.
- Lack of verification of collected data from any other independent body
- Shortage of staff at district DISH offices.

3.2 Comparison B/w Total sum of accidents from all district (RTI) Vs published Data

Figure 4 ,5 ,6 shows that there is a significant difference between DISH published data (represented by the yellow bar) and data acquired through the RTI process (represented by the green bar). Ideally, both values should match (district DISH office data is input for DISH HO to publish), but because of discrepancies as discussed above there is variation as shown in below comparative analysis,

Note: DISH Published data are not available for years 2018 & 2019.

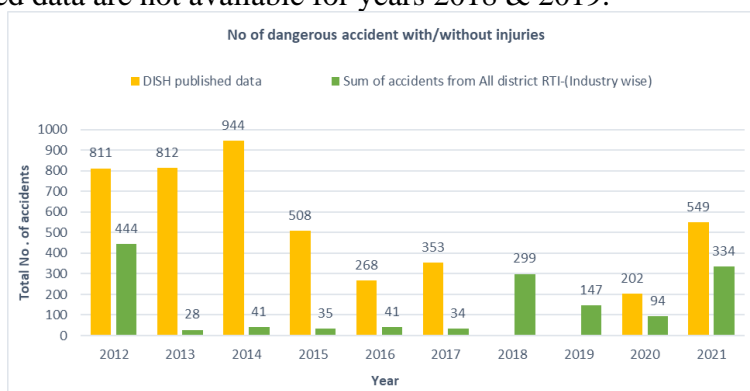


Figure 4: comparison of No. of dangerous accident collects by RTI Vs Published by DISH

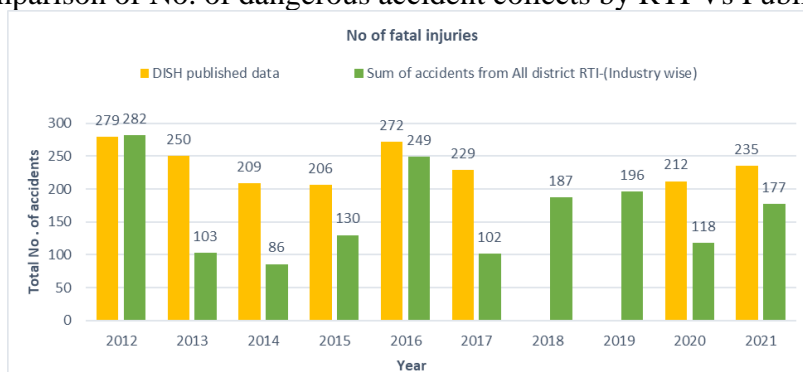


Figure 5: Comparison of No. of fatal accident collects by RTI Vs Published by DISH

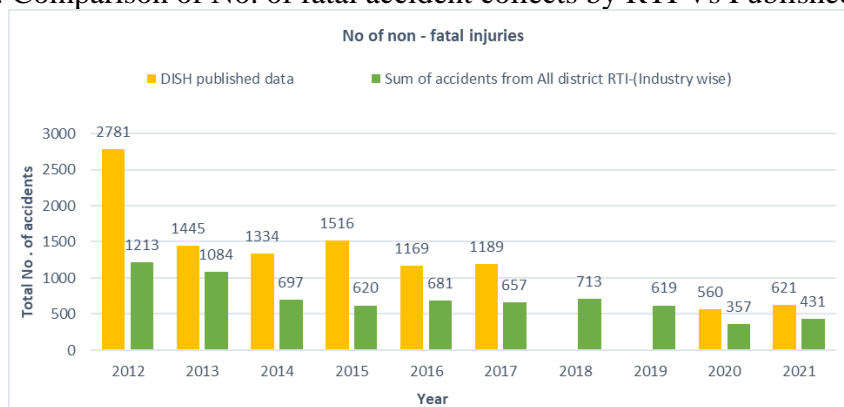


Figure 6: Comparison of No. of non- fatal accident collects by RTI Vs Published by DISH Yellow bar, represents DISH published data, which shows substantial difference compared to the RTI-derived data (green bar). The principal cause behind this variation is unavailability and completeness of data received through the RTIs. [Table 2 & 3].

3.3 Result and discussion for trend analysis

An attempt was made to analyze available data and hence various table in below sections depicts trend of incidents, injuries, and fatalities between 2012 and 2021.

3.3.1 Industry wise analysis

The District DISH offices have gathered data from 51 different types of industries [2][3]. Figure 7 shows all those industries where even a single fatality was recorded in 10-year period from 2012-2021. A total of 10,726 accidents have been reported during this period out of which 73.4% of accidents are recorded by just 6 industries i.e. Manufacture of Textile, Manufacture of chemical & chemical product, Manufacture of fabricated metal products except machinery and equipment, Manufacture of basic metal, Manufacture of machinery and equipment, Manufacture of coke and refined petroleum. Further trend analysis is performed only for these 6 industry types.

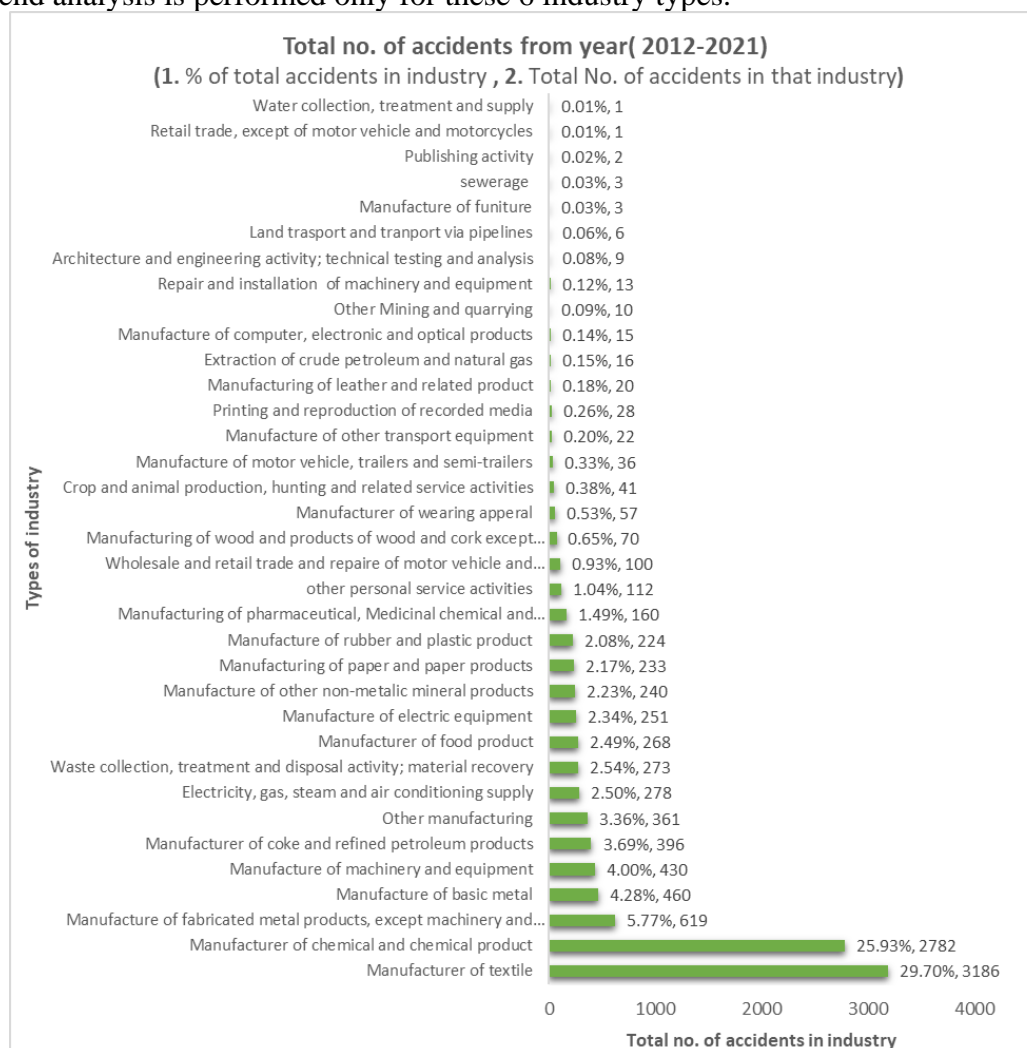


Figure 7: Total No. of accidents by various industries from year (2012-2021)

1) Trend Analysis for Manufacture of Textile

During the analysis period a total of 3186 accidents happened in Textile industry which is 29.70% of total accidents recorded from all 51 industries. Out of 3186 accidents 68% is non-fatal, 12% is fatal and 20% is dangerous injuries [2] [3]. Figure 8 shows that except for 2018 and slight peak in 2016 the accident trend is decreasing. However, there has been substantial rise in the accident cases during 2021 as compared to previous year. The reason for this increase or decrease in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

Note: Total no of injuries = No of dangerous injuries + No of nonfatal injuries + No of fatal injuries

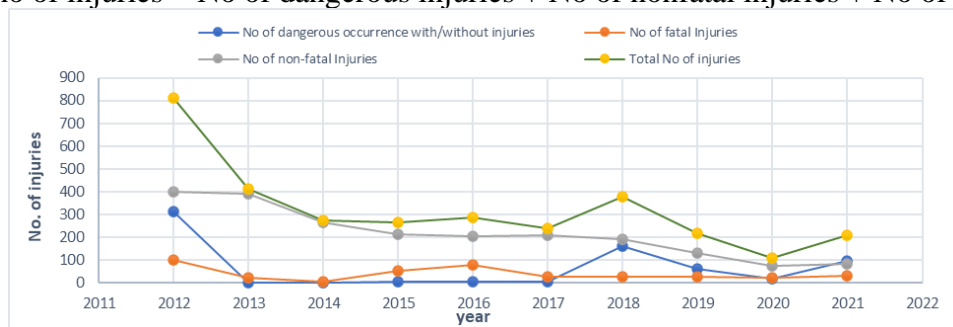


Figure 8: Year wise Injuries trend in Manufacture of Textile

2) Trend Analysis for Manufacture of Chemical and Chemical product

During the analysis period a total 2782 accidents happened in Chemical manufacture industry which is 25.94% of total accidents record form all 51 industries. Out of 2782 accidents 68.83% is non-fatal, 1%5.6 is fatal and 15.56 % is dangerous injuries [2] [3]. Figure 9 shows that except 2016 the accident trend is decreasing up to year 2017. However, there has been rise in the accidents cases after 2018 as compared to previous year. The reason for this increase or decrease in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

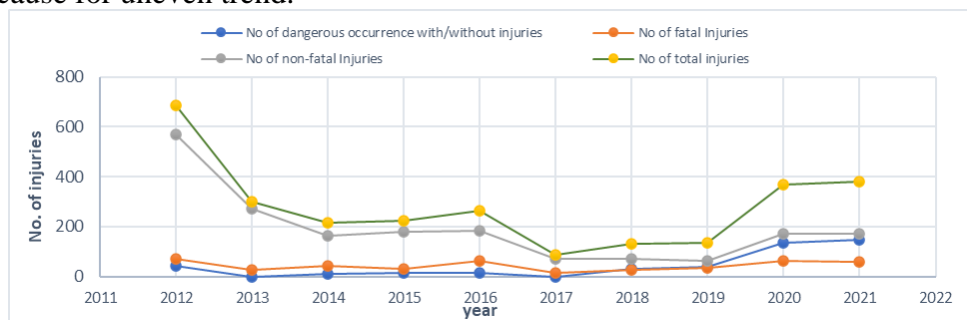


Figure 9: Year wise injuries trend in Manufacture of Chemical and Chemical product

3) Trend Analysis for Manufacture of fabricated metal product, except machinery and equipment

During the analysis period a total 619 accidents happened in Manufacture of fabricated metal product, except machinery and equipment industry which is 5.54% of Total accidents record from all 51 industries. Out of 619 accidents 69.46% is non-fatal, 15.67 is fatal and 14.86 % is dangerous injuries [2] [3]. Figure 10 shows that except peaks in 2013 and 2019 the accident trend is nearly constant up to year 2020 in rang of (30-60 injuries per year). However, there has been rise in the accidents cases after 2020 as compared to previous year. The reason for this rang bound or increase in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

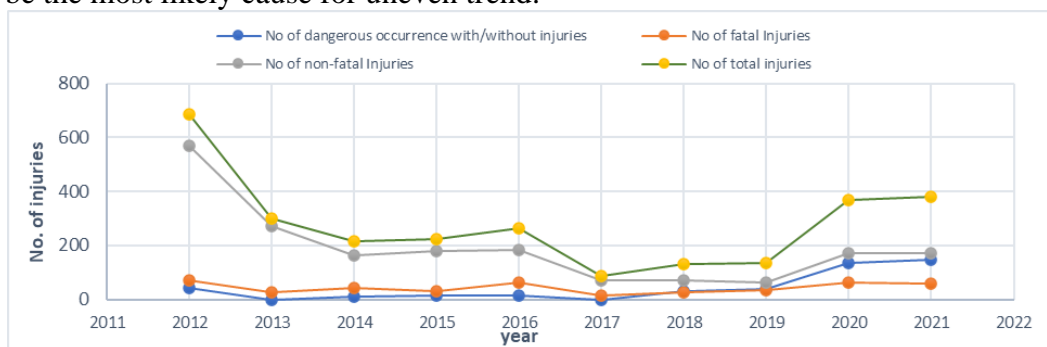


Figure 10: Year wise injuries trend in Manufacture of Fabricated metal product, except machinery and equipment

4) Trend Analysis for Manufacture of Basic Metal

During the analysis period a total 460 accidents happened in Manufacture of Basic metal industry which is 4.28% of Total accidents recorded from all 51 industries. Out of 460 accidents 60.21% is non-fatal, 24.78% is fatal and 15 % is dangerous injuries [2] [3]. Figure 11 shows that except slight peak in 2014 accident trend is decreasing up to year 2015. However, there has been rise in accidents after 2015 as compared to previous year. The reason for this increase or decrease in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

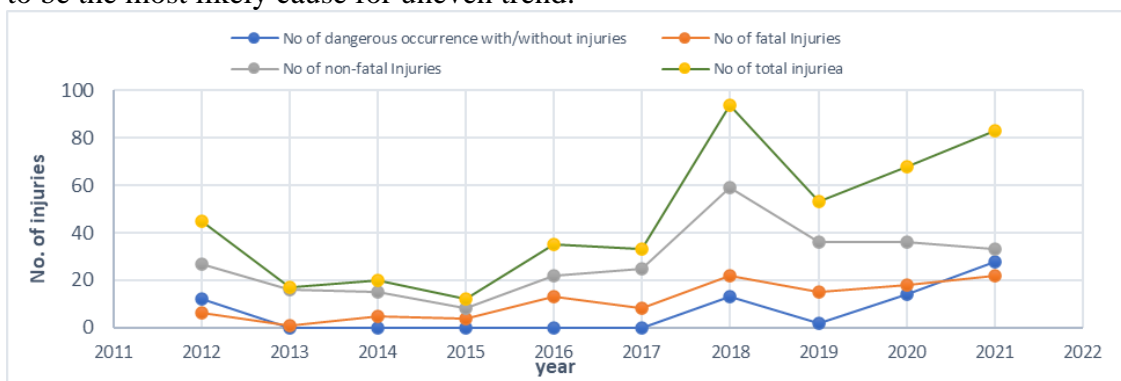


Figure 11: Year wise injuries trend in Manufacture of basic metal

5) Trend Analysis for Manufacture of machinery and equipment

During the analysis period a total 430 accidents happened in Manufacture of machinery and equipment industry which is 4.002 % of Total accidents recorded from all 51 industries. Out of 430 accidents 72.09 % is non-fatal, 10.23 % is fatal and 17.67 % is dangerous injuries [2] [3]. Figure 12 shows that accidents trend is decreasing up to year 2014. After 2014 accident has been in the range of 20-40 accident per year except year 2015. However, there has been rise in accidents in 2021 as compared to previous year. The reason for this increase or decrease in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

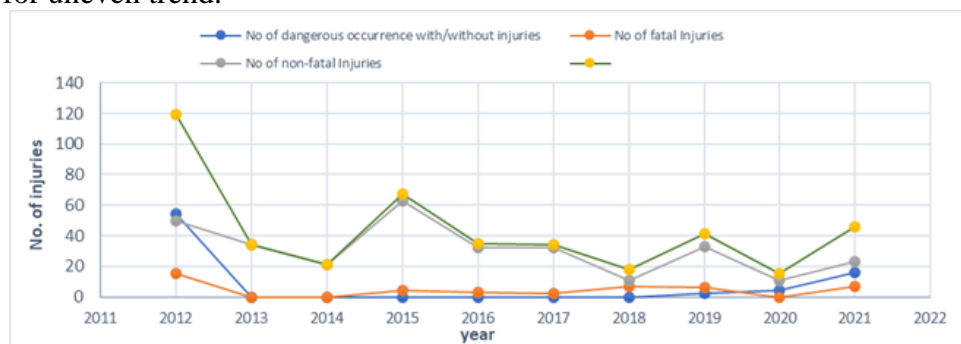


Figure 12: Year wise injuries trend in Manufacture of machinery and equipment

6) Trend Analysis for Manufacture of coke and refined petroleum products

During the analysis period a total 396 accidents happened in Manufacture of coke and refined products which is 3.69 % of Total accidents recorded from all 51 industries. Out of 396 accidents 83.83 % is non-fatal, 12.12 % is fatal and 4.04 % is dangerous injuries [2] [3]. Figure 13 shows that except 2016 the accident trend is increasing up to year 2017. However, there has been down fall in accidents after year 2017 as compared to previous year. The reason for this increase or decrease in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

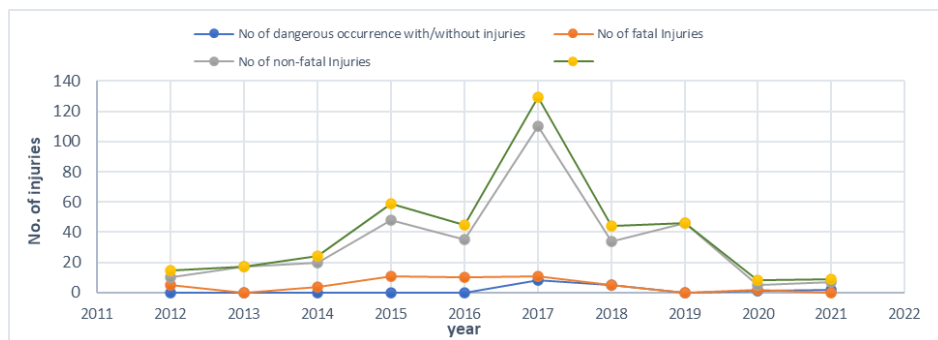


Figure 13: Year wise injuries trend in Manufacture of coke and refined petroleum products

3.3.2. District wise distribution of accidents in top 6 industry types

Following table shows districts with highest occurrence of accidents in a particular type of industry

Table 10: District wise distribution of injuries for top 6 industry [2] [3]

Industry type	Total No of injuries between 2012-2021	Top 5 Districts (cumulative data of year 2012 to 2021)
1. Manufacture of textile	Total no of accidents: 3186. 3047 (95.63%) no. of accidents occurred in 5 districts	<p>District wise distribution of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <ul style="list-style-type: none"> Surat: 1090, 34% Ahmedabad: 345, 11% Jamanagar: 584, 18% Nadiad: 246, 8% Vadodara: 139, 4% Other cities: 782, 25%
2. Manufacture of chemical and chemical product	Total no of accidents: 2782. 2376 (85.40%) no. of accidents occurred in 5 districts	<p>District wise distribution of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <ul style="list-style-type: none"> Bharuch: 406, 15% Surendranagar: 144, 5% Vadodara: 206, 7% Surat: 1119, 40% Ahmedabad: 366, 13% Other cities: 541, 20%
3. Manufacture of fabricated metal product, except machinery and equipment	Total no of accidents: 619. 498 (80.45%) no. of accidents occurred in 5 districts	<p>District wise distribution of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <ul style="list-style-type: none"> Surat: 121, 19% Vadodara: 36, 6% Adipur(kutch): 36, 6% Bhavnagar: 65, 10% Bharuch: 190, 31% Other cities: 171, 28%

Industry type	Total No of injuries between 2012-2021	Top 5 Districts (cumulative data of year 2012 to 2021)																					
<p>4. Manufacture of basic metals</p>	<p>Total no of accidents: 460. 345 (75%) no. of accidents occurred in 5 districts</p>	<p>District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <table border="1"> <tr><th>District</th><th>Total no. of accidents</th><th>% of total accidents</th></tr> <tr><td>Bhavnagar</td><td>115</td><td>25%</td></tr> <tr><td>Adipur(kutch)</td><td>25</td><td>5%</td></tr> <tr><td>Surat</td><td>41</td><td>9%</td></tr> <tr><td>Jamanagar</td><td>40</td><td>9%</td></tr> <tr><td>Ahmedabad</td><td>94</td><td>20%</td></tr> <tr><td>Other cities</td><td>145</td><td>32%</td></tr> </table>	District	Total no. of accidents	% of total accidents	Bhavnagar	115	25%	Adipur(kutch)	25	5%	Surat	41	9%	Jamanagar	40	9%	Ahmedabad	94	20%	Other cities	145	32%
District	Total no. of accidents	% of total accidents																					
Bhavnagar	115	25%																					
Adipur(kutch)	25	5%																					
Surat	41	9%																					
Jamanagar	40	9%																					
Ahmedabad	94	20%																					
Other cities	145	32%																					
<p>5. Manufacture of machinery and equipment</p>	<p>Total no of accidents: 430. 372 (86.51%) no. of accidents occurred in 5 districts</p>	<p>District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <table border="1"> <tr><th>District</th><th>Total no. of accidents</th><th>% of total accidents</th></tr> <tr><td>Vadodara</td><td>58</td><td>14%</td></tr> <tr><td>Ahmedabad</td><td>22</td><td>5%</td></tr> <tr><td>Surat</td><td>40</td><td>9%</td></tr> <tr><td>Nadiad</td><td>17</td><td>4%</td></tr> <tr><td>Bharuch</td><td>117</td><td>27%</td></tr> <tr><td>Other district</td><td>176</td><td>41%</td></tr> </table>	District	Total no. of accidents	% of total accidents	Vadodara	58	14%	Ahmedabad	22	5%	Surat	40	9%	Nadiad	17	4%	Bharuch	117	27%	Other district	176	41%
District	Total no. of accidents	% of total accidents																					
Vadodara	58	14%																					
Ahmedabad	22	5%																					
Surat	40	9%																					
Nadiad	17	4%																					
Bharuch	117	27%																					
Other district	176	41%																					
<p>6. Manufacture of coke and refined petroleum products</p>	<p>Total no of accidents: 396. 395 (99.74%) no. of accidents occurred in 5 districts</p>	<p>District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <table border="1"> <tr><th>District</th><th>Total no. of accidents</th><th>% of total accidents</th></tr> <tr><td>Jamanagar</td><td>72</td><td>18%</td></tr> <tr><td>Bharuch</td><td>2</td><td>1%</td></tr> <tr><td>Vadodara</td><td>21</td><td>5%</td></tr> <tr><td>Surat</td><td>1</td><td>0%</td></tr> <tr><td>Adipur(kutch)</td><td>186</td><td>47%</td></tr> <tr><td>Other district</td><td>114</td><td>29%</td></tr> </table>	District	Total no. of accidents	% of total accidents	Jamanagar	72	18%	Bharuch	2	1%	Vadodara	21	5%	Surat	1	0%	Adipur(kutch)	186	47%	Other district	114	29%
District	Total no. of accidents	% of total accidents																					
Jamanagar	72	18%																					
Bharuch	2	1%																					
Vadodara	21	5%																					
Surat	1	0%																					
Adipur(kutch)	186	47%																					
Other district	114	29%																					

The table shows that Surat, Ahmedabad, Bharuch, Jamnagar and Baroda are leading in industry accidents over multiple industry types. Obviously because these districts have maximum concentration of industries.

3.3.3 Cause wise analysis

DISH district offices classify accident data in to 15 different causes as shown in Figure 14. Out of these 15 causes 7 of the causes contributes for 57% of accidents. These causes are ‘Machinery moved by mechanical power’, ‘Persons falling’, ‘stepping on or striking objects’, ‘struck by falling bodies’, ‘Handling goods’, ‘Fire’ and ‘Explosion’.

Moreover, about 23% of accidents are not classified under any causes and hence are listed in ‘others’ category. The trend analysis is performed for these 7 causes.

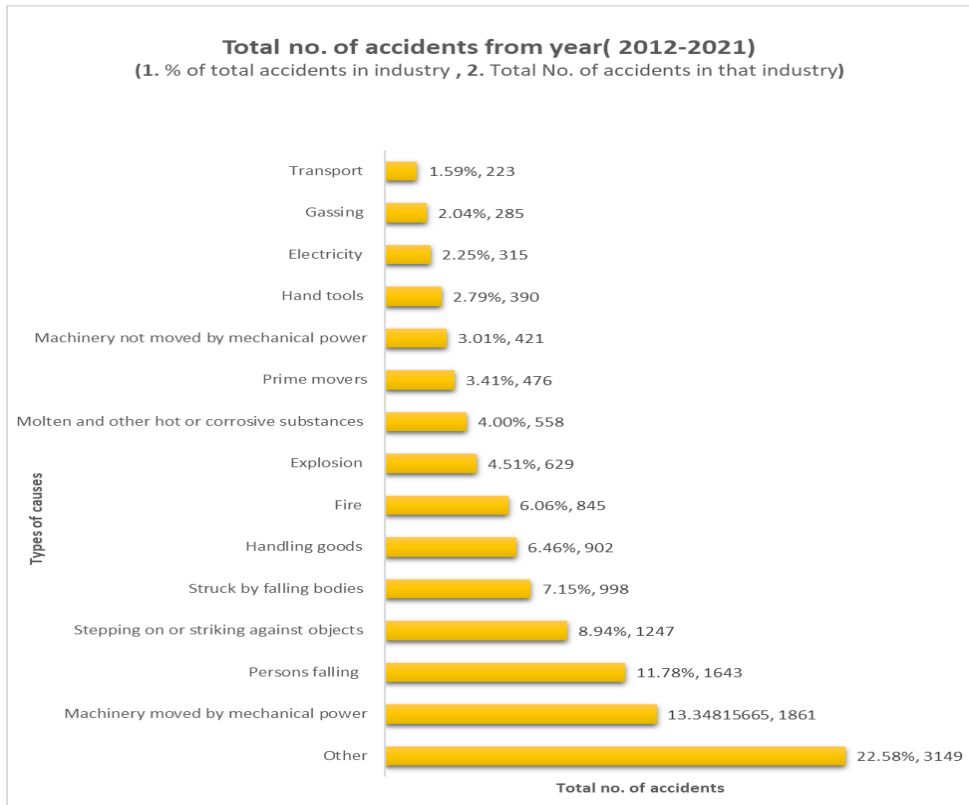


Figure 14: Total No. of accidents by various causes from year (2012-2022)

1) Accident by Machinery moved by mechanical power.

During the analysis period a total of 1861 accidents happened in Machinery moved by mechanical power which is 13.34% of Total accidents recorded from all 15 causes. Out of 1861 accidents 68.29% is non-fatal, 21.70 is fatal and 9.99 % is dangerous injuries [2] [3]. Figure 15 shows that accident trend is decreasing till 2014 and again increasing up to year 2016. However, there has been down fall in accident after year 2016. The reason for this increase or decrease in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

Note: Total no of injuries = No of dangerous injuries + No of nonfatal injuries + No of fatal injuries

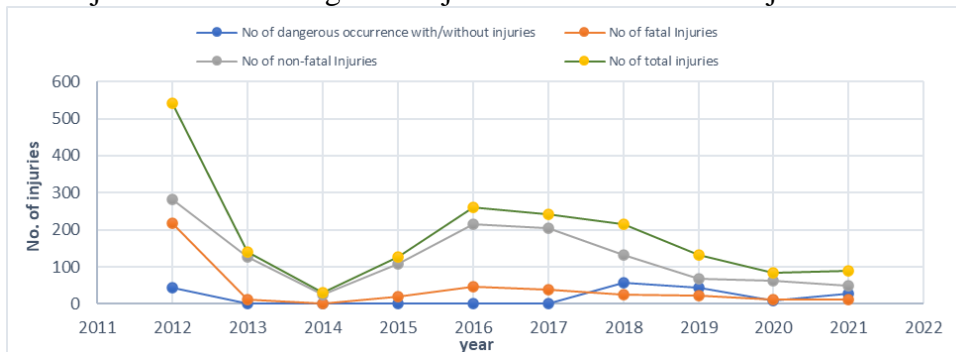


Figure 15: Year wise injuries trend in machinery moved by mechanical power

2) Accident by person falling

During the analysis period a total of 1643 accidents happened in Person falling which is 11.78% of Total accidents recorded from all 15 causes. Out of 1643 accidents 68.71% is non-fatal, 17.40 is fatal and 13.87% is dangerous injuries [2] [3]. Figure 16 shows that except 2012 accident trend is nearly constant in the range of 100-150 accidents per year. However, there has been rise in accidents in year 2021 as compared to previous years. The reason for this increase or constant in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

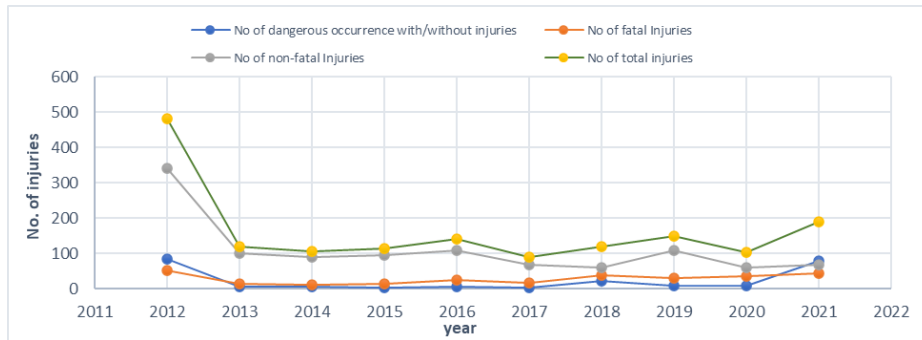


Figure 16: Year wise injuries trend in person falling

3) Accident by stepping on or striking against objects

During the analysis period a total of 1247 accidents happened in Stepping on or striking against object which is 8.94% of Total accidents recorded from all 15 causes. Out of 1247 accidents 83.16% is non-fatal, 6.33 is fatal and 10.51% is dangerous injuries [2] [3]. Figure 17 shows that except peak of 2012 accident trend is constant (in between 50 -100 accident per year). The reason for this decrease or constant in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

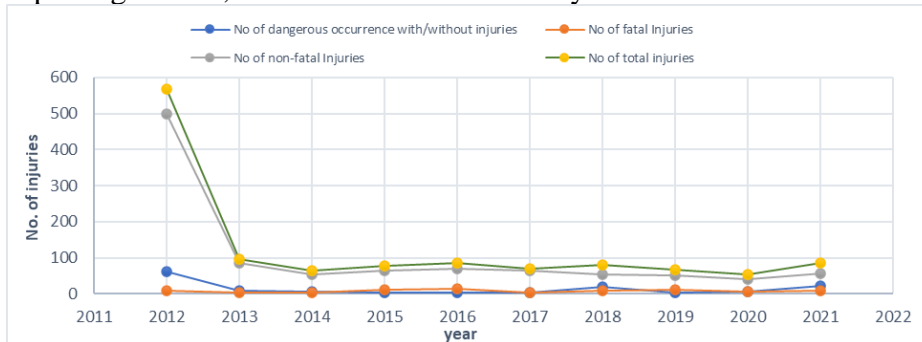


Figure 17: Year wise injuries trend in stepping or striking against objects

4) Accident by Struck by falling bodies

During the analysis period a total of 998 accidents happened in Struck by falling bodies which is 7.15% of Total accidents recorded from all 15 causes. Out of 998 accidents 74.95% is non-fatal, 13.73 is fatal, 11.32% is dangerous injuries [2] [3]. Figure 18 shows that accident trend is decreasing up to years 2014. However, there has been rise in accident after 2014 as compared to previous years, except 2020 and slight decrease in 2016 accidents trend is increase. The reason for this decrease or increase in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

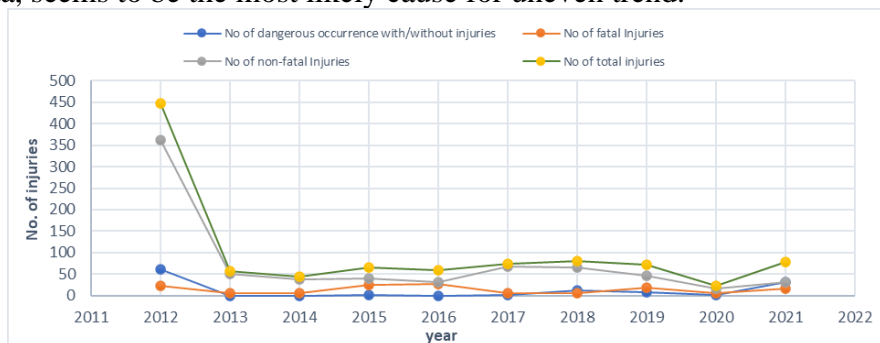


Figure 18: Year wise injuries trend by Handling goods

5) Accident by Handling goods

During the analysis period a total of 902 accidents happened in Handling goods which is 6.46% of Total accidents recorded from all 15 causes. Out of 902 accidents 81.15% is non-fatal, 6.76 is fatal and 12.08% is dangerous injuries [2] [3]. Figure 19 shows that except peak of 2012 accident trend is

decreasing. However, there has been rise in accident cases during 2021 as compared to previous year. The reason for this decrease or increase in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

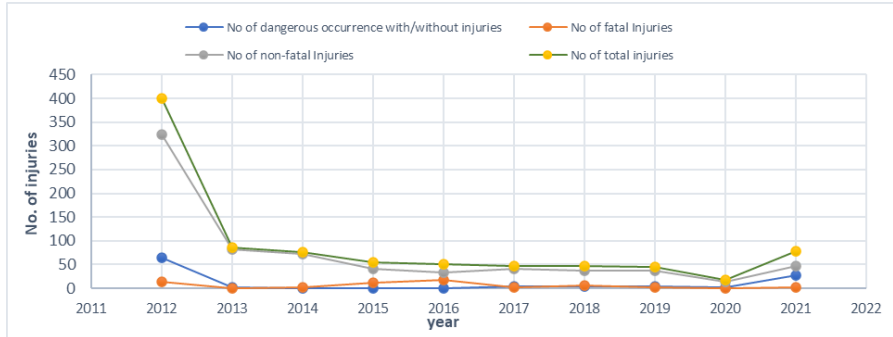


Figure 19: Year wise accident trend by Handling goods

6) Accident by Fire

During the analysis period a total of 845 accidents happened in Fire which is 6.06% of Total accidents recorded from all 15 causes. Out of 845 accidents 51.83 % is non-fatal, 13.25 is fatal and 34.91 % is dangerous injuries [2] [3]. Figure 20 shows that there is a zigzag accident trend up to year 2019. However, there has been rise in accidents after 2019. The reason for this decrease or increase in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

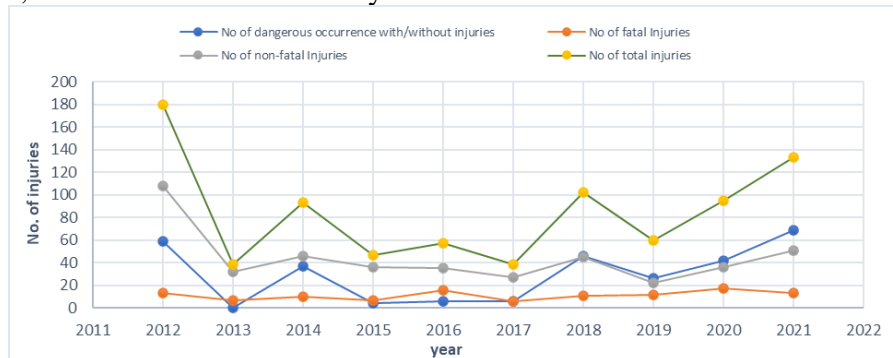


Figure 20: Year wise injuries trend by fire

7) Accident by Explosion

During the analysis period a total of 629 accidents happened in Explosion which is 4.51 % of Total accidents recorded from all 15 causes. Out of 629 accidents 63.43 % is non-fatal, 24.80 is fatal and 11.76% is dangerous injuries [2] [3]. Figure 21 shows that except 2012 and 2020 accident trend is slightly increasing and decreasing during year 2012 to 2020 in the range of 20-45 accidents per years. However, there has been down fall in accidents during year 2021. The reason for this decrease or increase in trend is unknown as there is no analysis report available. However, discrepancy in the collection and reporting of data, seems to be the most likely cause for uneven trend.

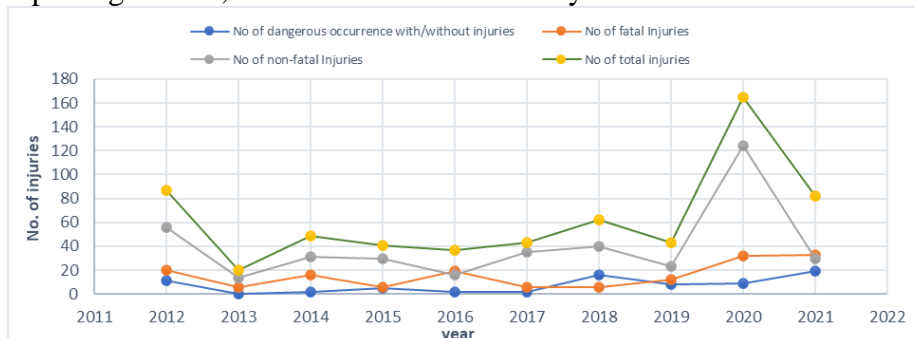


Figure 21: Year wise injuries trend by Explosion

3.3.4 District wise distribution of injuries occurred by top 7 causes

Following table shows districts with highest occurrence of accidents due to a particular cause.

Table 11: District wise distribution of injuries for top 7 causes [2] [3]

Cause of injury	Total No of injuries between 2012-2021	Top 5 Districts (cumulative data of year 2012 to 2021)
1. Mechanical power	Total no of accidents:1861. 1543 (82.91%) no. of accidents occurred in 5 districts	<p data-bbox="715 544 1305 589">District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p>
2. Person falling	Total no of accidents: 1643. 1083 (65.91%) no. of accidents occurred in 5 districts	<p data-bbox="715 902 1305 947">District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p>
3. Stepping on or striking against object	Total no of accidents:1247. 965 (77.83%) no. of accidents occurred in 5 districts	<p data-bbox="715 1261 1305 1305">District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p>
4. Struck by falling bodies	Total no of accidents: 998. 817 (81.86%) no. of accidents occurred in 5 districts	<p data-bbox="715 1619 1305 1664">District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p>

Cause of injury	Total No of injuries between 2012-2021	Top 5 Districts (cumulative data of year 2012 to 2021)																					
5. Handling goods	Total no of accidents: 902. 708 (78.49%) no. of accidents occurred in 5 districts	<p data-bbox="715 421 1294 465">District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <table border="1"> <thead> <tr> <th>District</th> <th>Total no. of accidents</th> <th>% of total accidents</th> </tr> </thead> <tbody> <tr><td>Ahmedabad</td><td>329</td><td>32%</td></tr> <tr><td>Vadodara</td><td>126</td><td>12%</td></tr> <tr><td>Jamanagar</td><td>106</td><td>10%</td></tr> <tr><td>Nadiad</td><td>80</td><td>8%</td></tr> <tr><td>Surendranagar</td><td>67</td><td>7%</td></tr> <tr><td>Other district</td><td>323</td><td>31%</td></tr> </tbody> </table>	District	Total no. of accidents	% of total accidents	Ahmedabad	329	32%	Vadodara	126	12%	Jamanagar	106	10%	Nadiad	80	8%	Surendranagar	67	7%	Other district	323	31%
District	Total no. of accidents	% of total accidents																					
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Vadodara	126	12%																					
Jamanagar	106	10%																					
Nadiad	80	8%																					
Surendranagar	67	7%																					
Other district	323	31%																					
6. Fire	Total no of accidents: 885. 700 (82.84) no. of accidents occurred in 5 districts	<p data-bbox="715 786 1294 831">District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <table border="1"> <thead> <tr> <th>District</th> <th>Total no. of accidents</th> <th>% of total accidents</th> </tr> </thead> <tbody> <tr><td>Bharuch</td><td>252</td><td>30%</td></tr> <tr><td>Ahmedabad</td><td>184</td><td>22%</td></tr> <tr><td>Vadodara</td><td>113</td><td>13%</td></tr> <tr><td>Surat</td><td>113</td><td>13%</td></tr> <tr><td>Adipur(kutch)</td><td>145</td><td>17%</td></tr> <tr><td>Other district</td><td>38</td><td>5%</td></tr> </tbody> </table>	District	Total no. of accidents	% of total accidents	Bharuch	252	30%	Ahmedabad	184	22%	Vadodara	113	13%	Surat	113	13%	Adipur(kutch)	145	17%	Other district	38	5%
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Vadodara	113	13%																					
Surat	113	13%																					
Adipur(kutch)	145	17%																					
Other district	38	5%																					
7. Explosion	Total no of accidents: 629. 573 (91.09%) no. of accidents occurred in 5 districts	<p data-bbox="715 1151 1294 1196">District wise distributon of total number of injuries from year 2012 to 2021 [Graph shows (1. Total no. of accidents in district, 2. % of total accidents)]</p> <table border="1"> <thead> <tr> <th>District</th> <th>Total no. of accidents</th> <th>% of total accidents</th> </tr> </thead> <tbody> <tr><td>Bharuch</td><td>345</td><td>55%</td></tr> <tr><td>Vadodara</td><td>89</td><td>14%</td></tr> <tr><td>Ahmedabad</td><td>81</td><td>13%</td></tr> <tr><td>Valsad</td><td>56</td><td>9%</td></tr> <tr><td>Godhara</td><td>30</td><td>5%</td></tr> <tr><td>Other district</td><td>28</td><td>4%</td></tr> </tbody> </table>	District	Total no. of accidents	% of total accidents	Bharuch	345	55%	Vadodara	89	14%	Ahmedabad	81	13%	Valsad	56	9%	Godhara	30	5%	Other district	28	4%
District	Total no. of accidents	% of total accidents																					
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Vadodara	89	14%																					
Ahmedabad	81	13%																					
Valsad	56	9%																					
Godhara	30	5%																					
Other district	28	4%																					

The table shows that Surat, Ahmedabad, Bharuch, Jamnagar and Baroda are leading in industry accidents over multiple industry types. Obviously because these districts have maximum concentration of industries.

Use and importance of actual data (data without discrepancy)

By using the data of the total number of accidents and its causes in each year from 2012 to 2021 depicts the trend of the accident occurrence. It provides insight to identify:

- Districts which are frequently prone to accidents
- Industry types where the frequency of accidents is higher than other industries
- Inherent causes which frequently contributes towards accident occurrences.
- Comparison of accident occurrences between districts, all industries within district and predominant causes within district.
- Comparison of accident occurrences within same industry type and similar causes between different districts

Since, there are anomalies, obviously uncertainty exist in the credibility of the data. Since, the data is not credible, corrective action cannot be taken either for the type industry, or causes. Hence, there is always a risk of repeating the same accident trends over the years without any effective mitigation.

4. Proposal of new model for data collection, monitoring, and analysis

A straightforward approach is proposed to enhance industrial safety by adopting digital solutions for incident reporting. The current reliance on manual paperwork often leads to errors, hindering the accuracy of reported information. The proposal suggests transitioning to a digital system to streamline processes and reduce mistakes.

The process is shown in Figure 22 below.

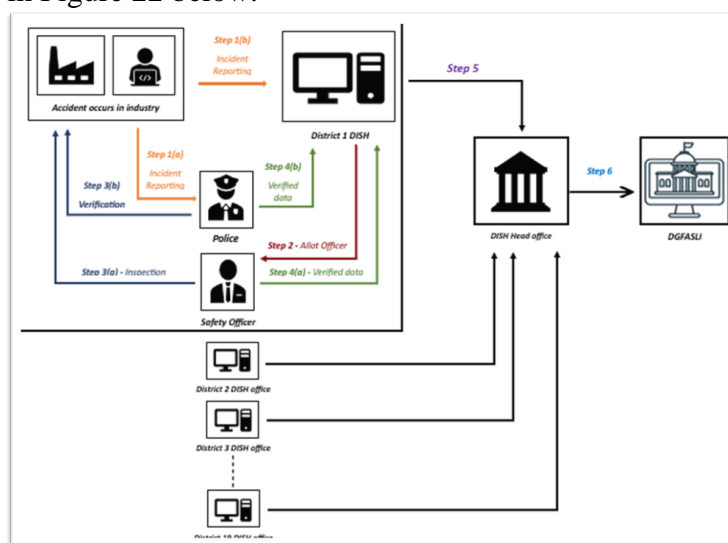


Figure 22: Industrial accident reporting by digital method

The process of reporting of industrial accident is described in Table 12 [7]:

Table 12: Steps for Reporting method

Steps	Action by Industry	Action by Police	Action by DISH
1	<ul style="list-style-type: none"> - 1a. Initiate the accident reporting process by promptly informing the nearest police station and - 1b. Inform DISH by filling the online accident reporting form in DISH portal 	- -	- -
2	-	- Assign a police sub-inspector to conduct an investigation	- Assign safety officer / Competent person to verify the received information.

Steps	Action by Industry	Action by Police	Action by DISH
		particularly if it is fatality.	
3	- Co-operate with Police and DISH	- 3a. the police Sub-inspector conducts on-site investigation (if fatal injury) or verification of received information	- 3b. The safety officer / competent person conducts on-site inspection to understand the circumstances surrounding the accident, assessing industry responses, and ensuring compliance with workspace safety regulations.
4	-	- 4a. The PSI submits report on the DISH portal	- 4b. The safety officer / competent person submits report on the DISH portal
5	-	-	- Upon completion of the verification process, the status changes from pending to verified, signifying the endorsement of the data by the District DISH office. - Further legal process for any corrective or punitive action on the industry. - The interconnected server system ensures real-time updates of accident data on the DISH head office server, providing an accurate and current overview.
6	-	-	- DISH head office disseminates the annual industrial accident report through publication on its official website and submission to the DGFASLI. - The DGFASLI server collects real-time accident data from state DISH head offices, facilitating the creation and publication of the annual industrial accident report for comprehensive national analysis.

4.1 Benefits of digital industrial accident reporting method:

1. The biggest benefit is elimination of manual error. Once the industry submits the data online the police and DISH officer independently verifies the submitted information, which is the fundamental step to make the data credible. Besides, all these activity is done on the same portal and hence eliminates the need for any duplication of paperwork.



2. DISH head office can see the real time number of total accidents and injuries for every district in the state and if implemented throughout the nation then DGFASLI can monitor the accident occurrences for every district in the country.
3. Besides accident, the status of inquiry and investigation can be seen in real time like pending verification cases, verified cases, total number of accidents, total number of injuries etc. Using this information, the head office can monitor the work progress of district DISH offices and take appropriate actions, make new rules and guidelines for safety at workspace,
4. Understanding the trend can lead to proactive methods for reducing reoccurrence of accidents and developing new technologies and training programs for workspace safety.

4.2 Challenges for digital industrial accident reporting method:

1. Online system may face technical issues, such as software glitch, server outages. These challenges can disrupt the data collection process and hinder the timely reporting of incidents. As a mitigation method, real time back-up of server data at regular time intervals may be necessary.
2. Online data collection also introduces cybersecurity related risks. Ensuring the physical and online security of accident data will prevent unauthorized access, data breaches or tampering.

5. Conclusion

In conclusion,

- Lack of uniform adherence to the latest NIC code 2008 across all district offices have led to uniform template of data collection
- Inconsistent data across 9 DISH offices, including Bharuch, Ahmedabad, Bhavnagar, Gandhinagar, Mahesana, Morbi, Surendra Nagar, Vadodara and Valsad, exposes inherent flaws in manual collection. Most likely reason being typos, format variations, lack of guidelines, delayed entries, absence of QC, and staff shortages may have contributed to persistent errors, necessitating urgent corrective measures.
- Published data and RTI-acquired data, deviating from the expected equality. This variance is primarily attributed to the unavailability and completeness of RTI-sourced data.
- The use of accurate, discrepancy-free historical data is crucial for understanding the trend of industrial accidents. This information not only highlights the dangers posed to workers in recent past but also aids in pinpointing industries and specific causes that require attention, and develop preventive measures. The presence of anomalies introduces uncertainty and doubt, thus compromising the credibility of the data and hindering effective corrective actions, potentially perpetuating unsafe trends in the future.
- trend analysis indicates that trend is random and unpredictable because of discrepancy in data collected by DISH office, mis match in data and unavailability of data. No mathematical pattern emerged from the data trend, leading to an inconclusive outcome.
- The proposed digital model for industrial accident reporting and verification offers a streamlined and efficient process to ensure credible and real-time data collection. By replacing manual procedures which are prone to errors, the new system enhances accuracy, facilitates prompt verification through on-site inspections, and enables immediate data updates at both the district and state levels.

Discrepancies in numerical values are evident in both the industry-wise and cause-wise records of injuries, highlighting inconsistencies among many offices. Addressing these variations by employing digital medium of real-time reporting & monitoring is crucial for ensuring accurate and standardized reporting across all districts and ultimately will act as pre-cursor to break the accident trends.



Acknowledgement

We extend our sincere appreciation to the Directorate of Industrial Safety and Health (DISH) for their vital role in facilitating this research. The collaboration of all 19 district DISH offices, coupled with the support from the Ahmedabad head office, has been fundamental for the outcome of this study. The responsiveness of DISH offices to the Right to Information (RTI) requests and the valuable information available on DISH office websites significantly contributed to the depth of this study.

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