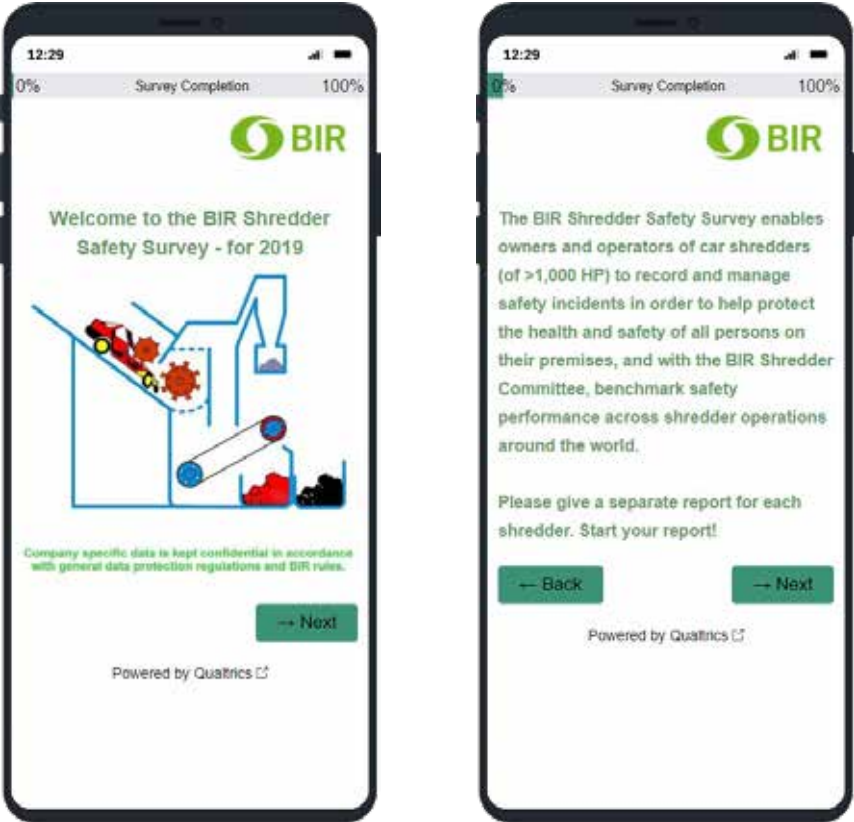


REPORT ON THE
**BIR SHREDDER
SAFETY SURVEY**
FOR **2019**



Bureau of
International
Recycling

Illustration of the survey on a smartphone:



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EXECUTIVE SUMMARY

The BIR Shredder Committee decided to initiate an **annual Shredder Safety Survey** for all large shredders around the world, having identified safety survey reporting to be to the general benefit of all shredder owners and operators. To date, only a limited number of countries has required reporting of industrial safety incidents, with those few reporting requirements being neither specific to shredders nor international in coverage. The BIR Shredder Safety Survey is intended to enable owners and operators of car shredders (of >1000 HP) to **record and manage safety incidents** in order to help protect the health and safety of all persons on their premises. Also, the BIR Shredder Safety Survey report is intended to enable shredder owners and operators to **benchmark their own safety performance** against other shredder operations around the world. This work was started in 2020 by collecting data for the previous year through the BIR Shredder Safety Survey 2019.

This **first worldwide survey** had a response rate of some 10%. Its distribution was limited by not having the contact details of the person responsible for safety issues at each shredder. Therefore, a number of changes will be made to increase the distribution of the next BIR Shredder Safety Survey for 2020.

As no fatalities were reported by the 10% sample, the fatal work accident rate was zero fatalities per 100,000 full-time equivalent workers. The non-fatal accident rate was 3100 per 100,000 full-time equivalent workers.

This annual report may be used to give **safety briefings to temporary and permanent employees as well as to contractors** working on shredder sites. This first report provides feedback to those companies that responded, and will serve as an encouragement to those companies that did not respond for 2019 when they are invited to participate in the BIR Shredder Safety Survey for 2020.

INTRODUCTION

Founded in 1948, the Bureau of International Recycling (BIR) is the only global recycling industry federation with a membership comprising companies and national recycling associations, from some 70 countries. BIR is organised into four Commodity Divisions and four Commodity Committees. The BIR Shredder Committee is allied to the BIR Ferrous Division.

The BIR Shredder Committee decided to initiate an annual shredder safety survey for all large shredders around the world, having identified this and the subsequent analysis of responses to be of general benefit to shredder owners and operators.

The BIR would like to recognise the contributions of The David J. Joseph Company (USA) to this report. It is based on the internal accident analysis conducted by The David J. Joseph Company's Christopher Bedell and Terry McWhorter in 2018 and presented to the BIR Shredder Committee in May of that year.

The BIR Shredder Committee thanks Ross Bartley from the BIR Secretariat for managing the survey software, analysing responses and drafting this report. An important aspect of his task was keeping company-specific data confidential in conformity with general data protection regulations - including where some countries have only one shredder operating, no country-by-country comparison is made.

As the survey will be carried out annually, trends over the years may be observed. Furthermore, benchmarking of individual shredder safety incidents against other shredders can be carried out by companies through comparing specific data from their internal reports (or the pdf files generated by this survey) with the general analyses in this annual report.

Alton Scott Newell III

Newell Recycling Equipment (USA)

BIR Shredder Committee Chairman

The image displays three sequential screens of a mobile application for a survey. Each screen features a status bar at the top with the time 12:29, a signal strength indicator, and a battery icon. Below the status bar is a progress bar labeled 'Survey Completion' with a green segment on the left and a grey segment on the right, showing 0% completion. The BIR logo is prominently displayed at the top of each screen.

Screen 1: Company Details
The first screen prompts the user to 'Please enter your company details:'. It includes two text input fields for 'Company name' and 'Town or City'. Below these is a dropdown menu for 'In which country is the shredder?'. At the bottom, there is a text input field for 'Which recycling trade association(s) is your company a member of?'. Navigation buttons '← Back' and '→ Next' are at the bottom, along with the text 'Powered by Qualtrics'.

Screen 2: GPS Coordinates
The second screen asks the user to 'To help authentication please give the GPS coordinates of the shredder - in Degrees Minutes Seconds or as Decimal Coordinates'. It includes a label 'from GPS or Mobile Phone' and two text input fields for 'Latitude' and 'Longitude'. Navigation buttons '← Back' and '→ Next' are at the bottom, along with the text 'Powered by Qualtrics'.

Screen 3: User Information
The third screen asks 'Who is making this report?'. It includes four text input fields for 'Title (Mr, Dr, Ms.)', 'Given name', 'Family name', and 'E-mail address'. Navigation buttons '← Back' and '→ Next' are at the bottom, along with the text 'Powered by Qualtrics'.

The survey questions relating to company name, town/city and country are used to identify and verify the data collected, particularly as companies may own a number of shredders in different countries. The GPS coordinates are also used to help differentiate shredder data. These identifiers are kept confidential.

The survey question on company membership of a recycling trade association is used to identify possible duplicate responses.

THE QUESTIONNAIRE AND ITS DISTRIBUTION

The BIR Shredder Safety Survey 2019 has three blocks of questions: (a) to identify the shredder and the person making the report; (b) to capture safety incident data; and (c) to help with comparative analysis using ratios and rates.

The BIR Shredder Safety Survey uses the Qualtrics internet-based system to provide a means for shredder owners and operators to record each incident and to save each report they make in the pdf file format.

Company-specific data are kept confidential in accordance with general data protection regulations and BIR rules.

Owners and operators of more than one shredder are asked to make a separate report of each incident or accident for each shredder.

Details of each safety incident should be entered separately, with one report for each injured person.

The BIR Shredder Committee decided that all shredder owners and operators were to be invited to participate in this survey and benchmarking. However, distribution was limited as few contact details were known of the persons responsible for safety issues at each shredder. Nevertheless, this first worldwide survey had a response rate of some 10%.

The invitation and link to the BIR Shredder Safety Survey 2019 on the Qualtrics platform was distributed by e-mail directly to BIR member companies owning or operating shredders, and also by e-mail to companies not affiliated to BIR where contact details were available. Several national recycling associations that have Shredder Committees assisted with the survey distribution. In that respect, Dr David Waggener of the US Institute of Scrap Recycling Industries was particularly helpful.

The survey of 2019 data was kept open until the end of 2020.

12:29

0% Survey Completion 100%

BIR

How many safety incidents did you have in 2019?

← Back → Next

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ANALYSIS OF RESPONSES

Companies using this survey are asked to give the total number of safety accidents for the shredder for which the report is made.

A way commonly used to analyse such information is to express the number of accidents in relation to the number of persons employed; this produces a ratio referred to as the “incidence rate”. This statistic gives an indication of the likelihood that someone had an accident.

There were some fatalities reported in the BIR Shredder Safety Survey 2019; however, on further examination, these were found to be data entry errors. As no fatalities were confirmed from the 10% of shredders around the world that responded, the BIR Shredder Safety Survey 2019 data gave the fatal work accident rate as zero fatalities per 100,000 full-time equivalent workers.

For comparison purposes across all industries, the 2019 fatal work injury rate for the USA was 3.5 fatalities per 100,000 full-time equivalent workers. Across the whole of the EU-27, there were 1.77 fatal accidents per 100,000 persons employed in 2018.

As fatal accidents at work are relatively rare events, so fatal accidents and their incidence rates can vary greatly from one year to the next.

The BIR Shredder Safety Survey 2019 data gave the non-fatal accident rate as 3100 per 100,000 full-time equivalent workers.

For comparison purposes across all industries, the 2019 non-fatal occupational injuries (and illnesses) rate for the USA was 2800 cases per 100,000 full-time equivalent workers. Across the EU-27, there were 1659 non-fatal accidents per 100,000 persons employed in 2018 - from less than 100 in Bulgaria to 3445 in France.

12:29

0%

Survey Completion

100%



Please enter details of each safety incident separately, with one report for each injured person

What month in 2019 was the incident ?

What day's date in that Month was the incident ?

← Back

→ Next

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12:29

0%

Survey Completion

100%



What time was the incident?

← Back

→ Next

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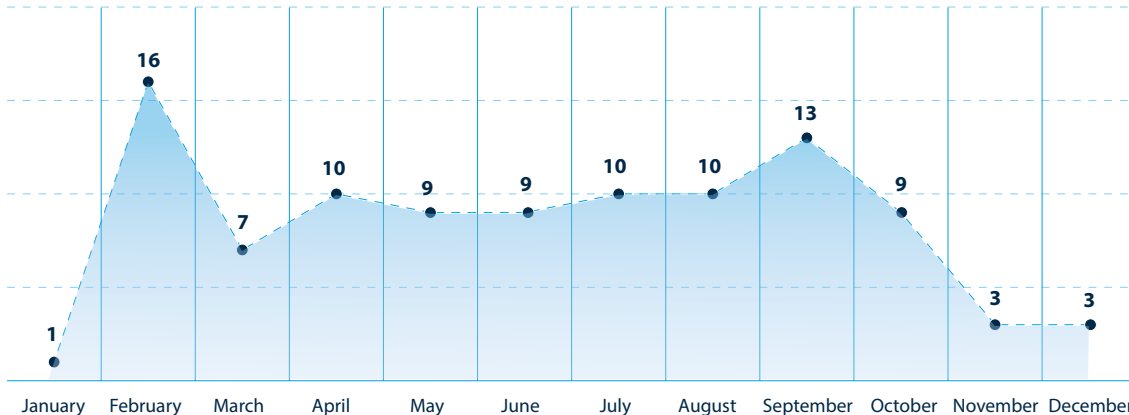
Month, day and time of accident

For each shredder, the month, day and time of an accident will identify one accident from another; besides, such data may show when accidents are most likely to occur.

For any given month, day and time in a worldwide survey, the seasons, outside temperatures, precipitation (rain, hail, snow) and amount of daylight will differ from country to country and across countries with multiple time zones.

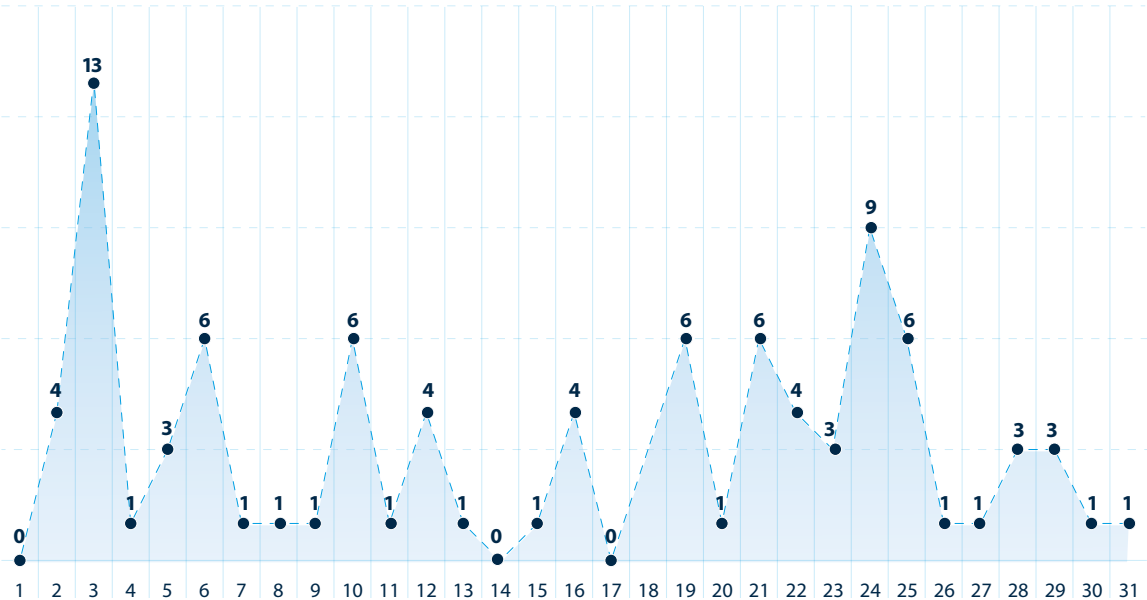
Furthermore, working practices differ from country to country regarding the working week, the number of shifts and respective working hours, as well as weekend working. Some industries, suppliers and customers shut down for holidays and for maintenance during particular months.

Accidents (%) Month



Data for the percentage of accidents by month show **fewer occurred in November, December and January.**

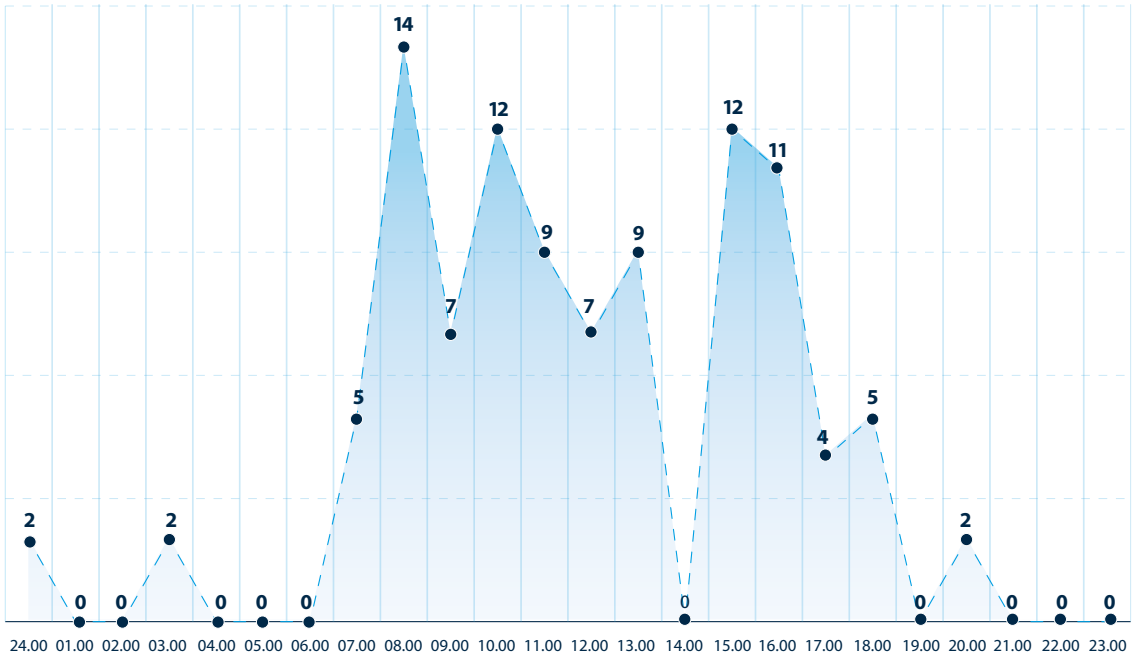
Accidents (%) Day of month



Data for the percentage of accidents by day of the month show **more occurred at the beginning of the month and three-quarters the way through the month**. The reason(s) for this distribution is (are) not known.

The BIR Shredder Committee had presupposed that shredder usage was greater towards the end of a month in order to fulfil deliveries to metalworking customers and so there would be a greater likelihood of accidents during these periods, but this was not reflected in the survey.

Accidents (%) Time of day (hrs)



Data for the percentage of accidents by time of day show that **most occurred between 07.00 hrs and 18.00 hrs, with a reduced rate around lunchtime.**

The reason for this higher frequency may be that most shredders in the survey have their hours of work restricted to between 07.00 hrs and 18.00 hrs, with the likelihood of accidents increasing with activity on the shredder site.

12:29 0% Survey Completion 100%

BIR

In which area of the shredder was the incident?

- Material Pile - Unloading Area
- Pre-shredder
- Infeed
- Conveyor
- Feed roll
- Hammer mill rotor
- Mill hydraulics
- Motor Control - Hydraulics Room
- Ferrous separation
- Non-ferrous separation

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- Non-metallics separation
- Shredded material pile
- Dust collection system
- Water system
- Ground Level
- Other (please specify in later description)

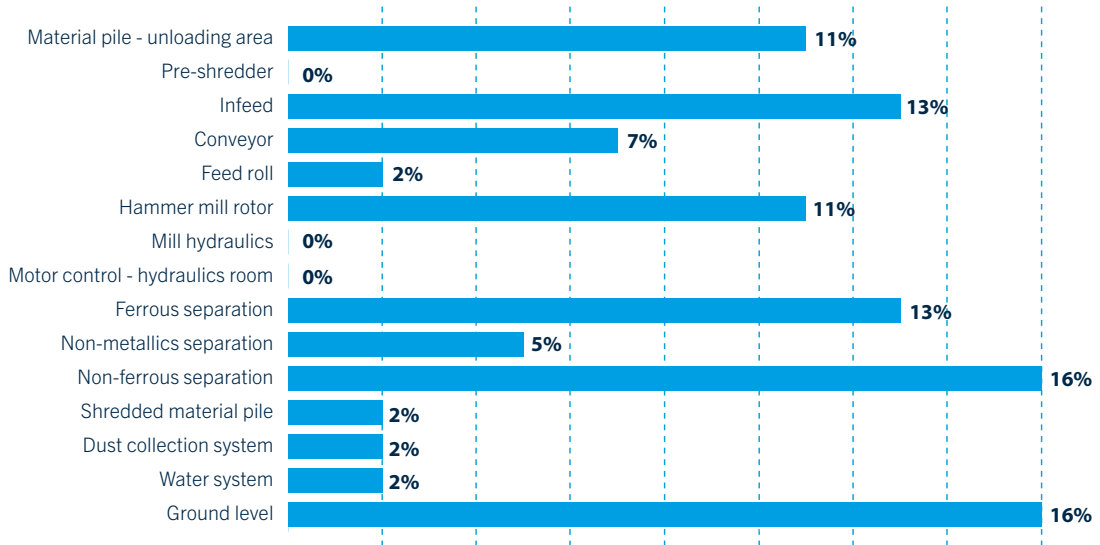
Did the incident occur during production or maintenance?

- Production
- Maintenance

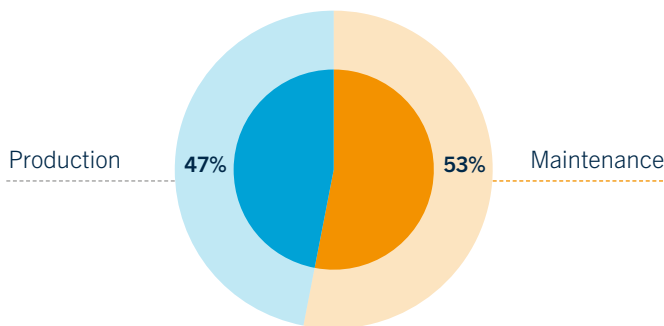
← Back → Next

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Area of shredder where accidents took place



Accidents took place during



Most accidents were **at the material pile, the shredder infeed, at metal separation and at ground level.**

Accidents were as likely to occur during maintenance as production.

12:29

0% Survey Completion 100%

BIR

Who was injured in the incident?

Employee

Temp

Contractor

How many years of experience did the injured person have?

Less than one year

1 to 3 years

4 to 9 years

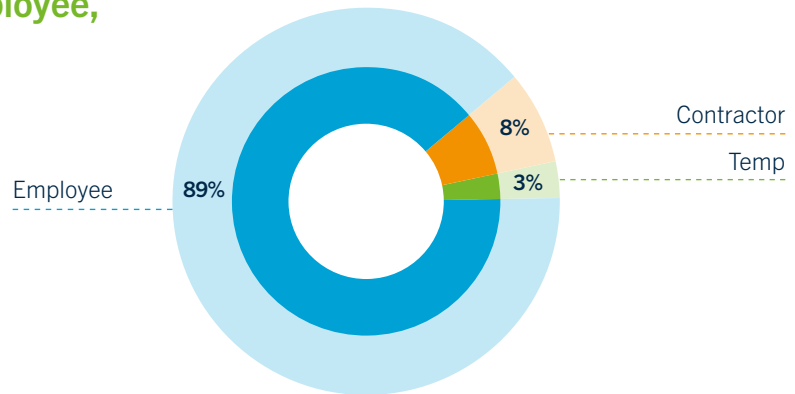
10 or more years

← Back

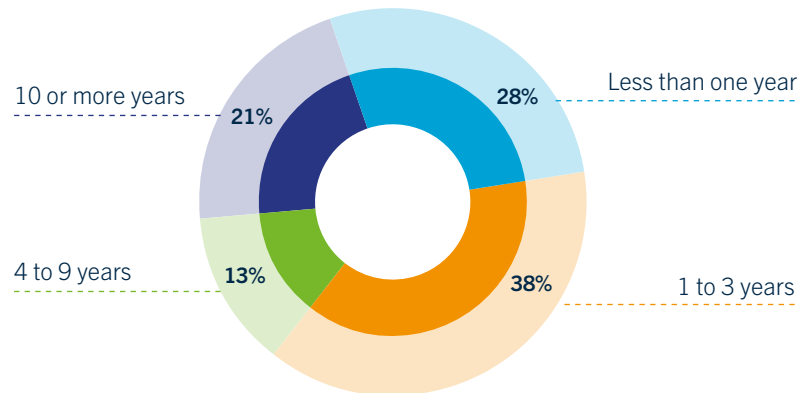
→ Next

Powered by Qualtrics

Who was injured: employee, temp or contractor?



Years of experience of the injured person



The majority of accidents occurred to full-time employees, with almost as many injured in their first year as in the following two years.

12:29 0% Survey Completion 100%

BIR

What was the injury or illness?

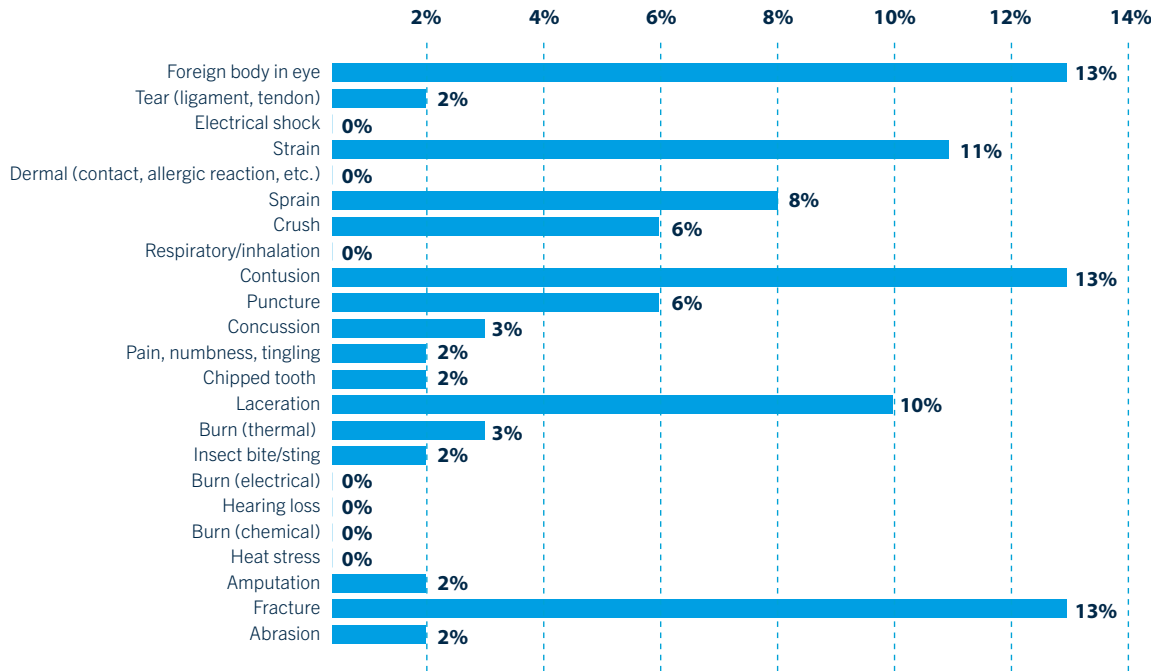
Abrasion	Fracture
Amputation	Heat stress
Burn (chemical)	Hearing Loss
Burn (electrical)	Insect bite/sting
Burn (thermal)	Laceration
Chipped Tooth	Pain, numbness, tingling

Concussion	Puncture
Contusion	Respiratory / Inhalation
Crush	Sprain
Dermal (contact, allergic reaction, etc.)	Strain
Electrical shock	Tear (ligament, tendon)
Foreign body in eye	Other (please specify in later description)

← Back → Next

Powered by Qualtrics

Nature of injury



The need for eye protection stands out from this analysis, as well as the need to take care around heavy and sharp objects.

12:29

0% Survey Completion 100%

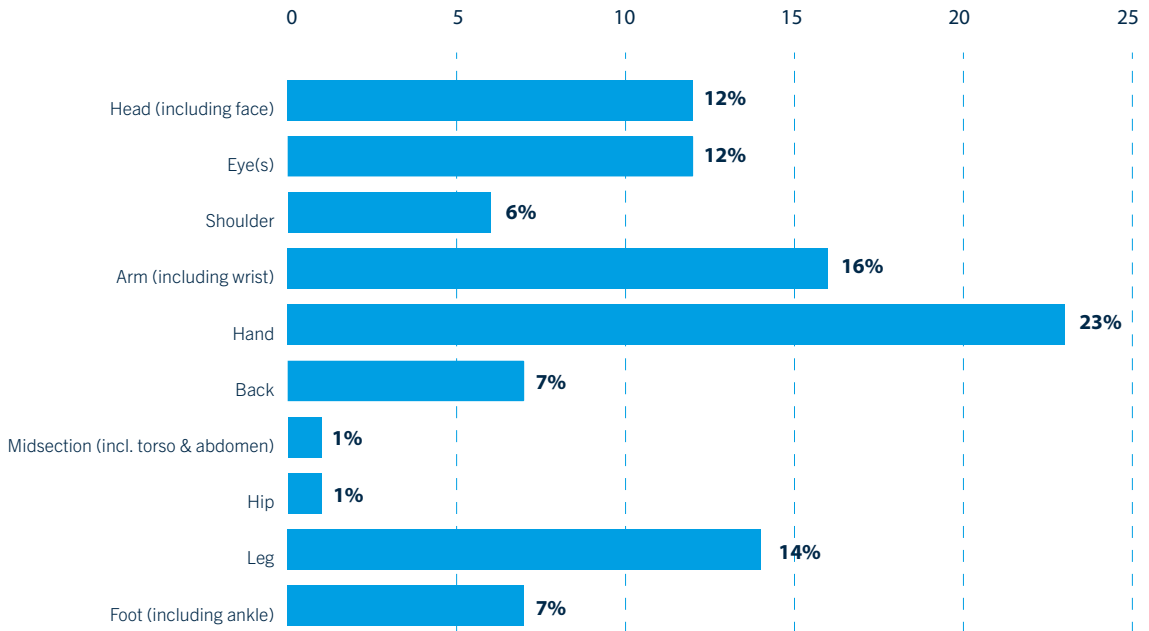
 BIR

What part of the body was injured?

Head (including face)	Hand
Eye(s)	Back
Shoulder	Hip
Midsection (including torso & abdomen)	Leg
Arm (including wrist)	Foot (including ankle)

← Back → Next

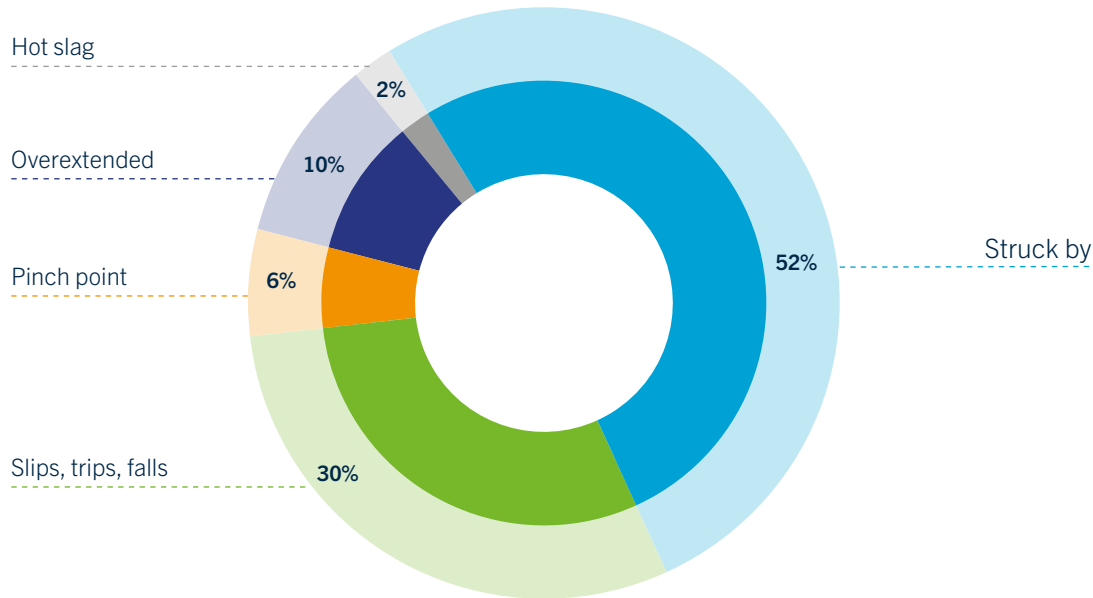
Part of the body injured



The analysis reinforces the necessity of protection, in particular for the **head** (hard-hat), **eyes** (safety glasses) and **hands** (gloves). Leg protection may also be considered.

The image shows a smartphone screen with a survey interface. At the top, the status bar shows the time 12:29, signal strength, and battery level. Below this is a green progress bar labeled 'Survey Completion' with '0%' on the left and '100%' on the right. The BIR logo is positioned in the upper right corner of the survey area. The main question, 'What caused the injury?', is centered. Below it are seven light gray rectangular buttons with the following text: 'Struck by', 'Slips, trips, falls', 'Pinch point', 'Overextended', 'Hot slag', and 'Other'. At the bottom of the survey area are two green buttons: '← Back' on the left and '→ Next' on the right. Below these buttons, the text 'Powered by Qualtrics' is displayed with a small logo to its right.

What caused the injury



The most common cause of injury was **being struck by objects**. The next most common cause was **“slips, trips and falls”**.

Less than one third of injuries had causes other than those identified above.

12:29

0% Survey Completion 100%



What task was the injured person doing?

Hammer work

Liners / other castings work

Mill maintenance

Feed roll work

Operating vehicle

Operating crane

Loading or unloading material

Clearing material

Cleaning under conveyor

Repairing conveyor

12:29

Picking

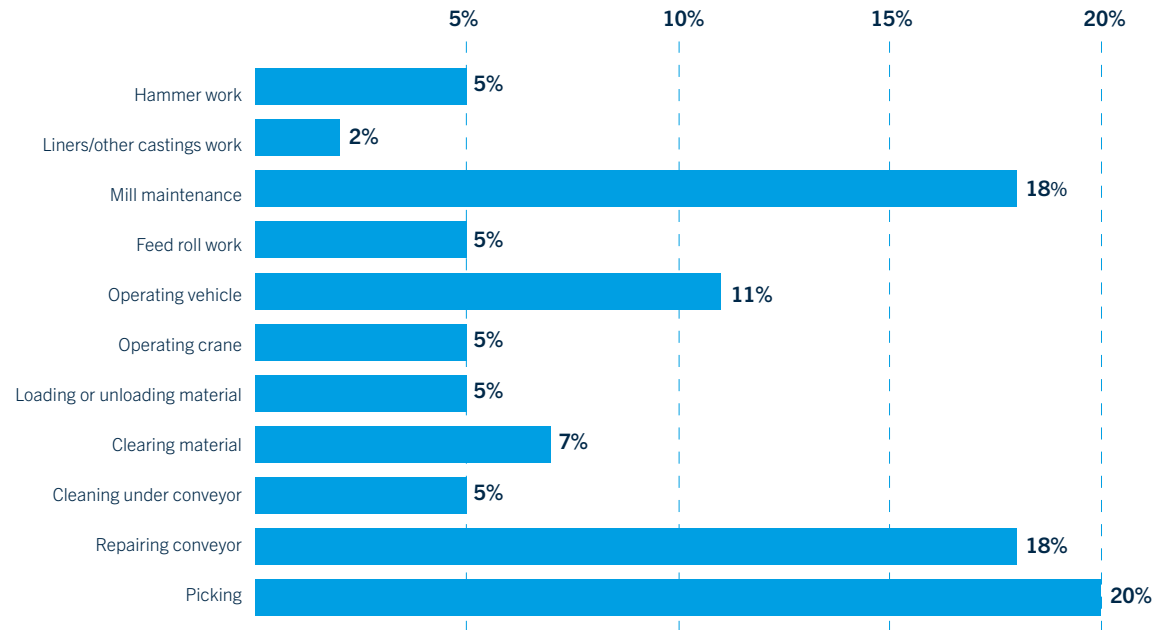
Other (please specify in later description)

← Back

→ Next

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Task being performed



Besides **vehicle operations**, most accidents occurred when **maintaining the mill, repairing conveyors** and **on the picking line**, correlating with the data on “Area of shredder where accidents took place”.

A third of incidents occurred while carrying out activities other than those identified.

12:29

0% Survey Completion 100%

 **BIR**

What specific activity was the injured person carrying out?

Clearing materials

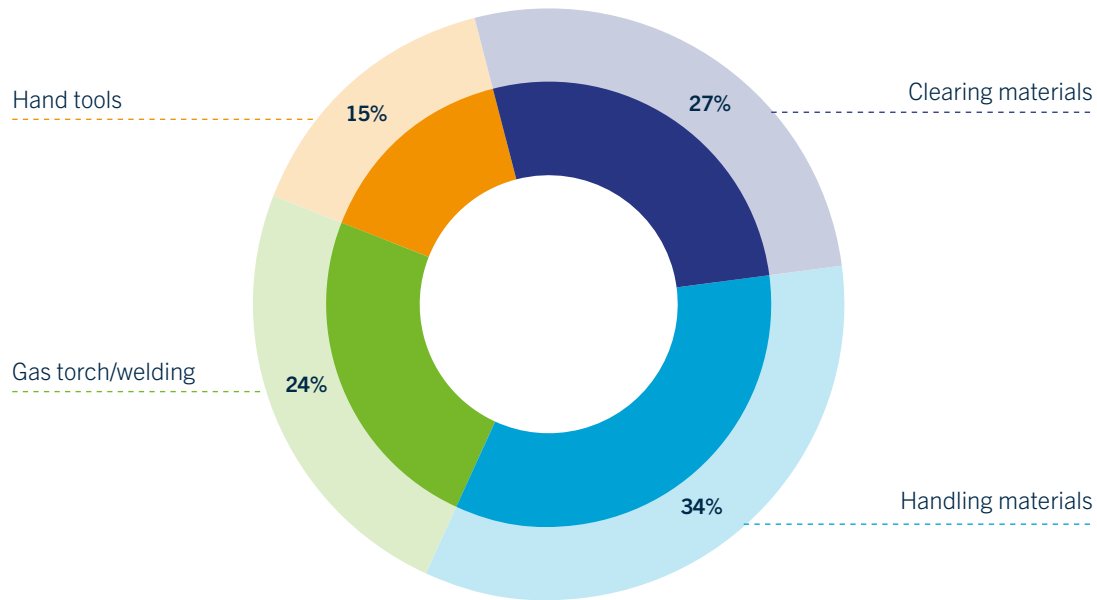
Handling materials

Gas torch / welding

Hand tools

Other (please specify in later description)

Activity being carried out



Over half of the activities leading up to an accident were not identified or recorded. Of those identified, well over half of accidents were caused by **handling or clearing materials**, correlating with the data on “Area of shredder where accidents took place”.

12:29

Did this incident result in:

Hospitalisation of the casualty? ^

☐ Yes

☐ No

A fatality? ^

☐ Yes

☐ No

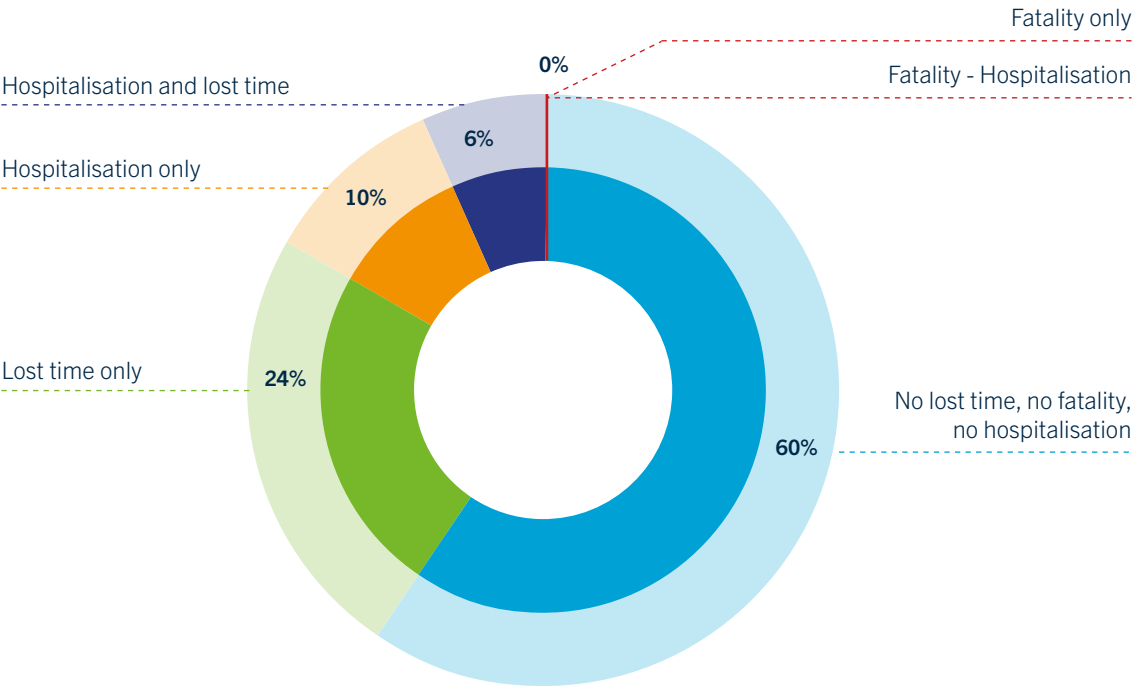
Lost time ^

☐ Yes

☐ No

← Back → Next

Result of accident: hospitalisation, fatality or lost time



This question gathered information on the severity of each accident. Some answers were a combination of all three indicators while others were a combination of two. Data showed that **60% of incidents resulted in no lost time, no fatality and no hospitalisation**, while a further **24% resulted in lost time only**. The likelihood is that nearly half of accidents were dealt with on site.

12:29

0% Survey Completion 100%

 **BIR**

What other relevant information about the incident is there that has not been included in your answers above?

[< Back](#) [Next >](#)

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Other relevant information

Companies have used this “free text” question to record other relevant information about the incident that was not included elsewhere.

This question is useful for companies to add other pertinent information into their pdf report.

Specific to shredder operations, several accidents were caused by deflagrations, which may happen if a container with residual liquid fuel or gas enters a shredder and ignites. No further information was provided in those instances.

Other relevant information picked up on wind-blown particles or debris entering people’s eyes when outside.

This question recorded accidents where material penetrated personal protective equipment, such as sharp items/wire penetrating gloves. Other accidents were recorded as more serious as personal protective equipment, though available, was not used.

An earlier question in the survey had picked up that the most common cause of injury was being struck by objects. The next most common cause had been “slips, trips and falls”. This additional, relevant information highlighted the need to be careful on stairways and walkways.

While quite unusual, this open question picked up that injuries may be caused in fights between persons on site.

12:29

0% Survey Completion 100%



Worker numbers on site (best estimate totals for 2019)

permanent employees ^

☐ up to 50

☐ 51 to 100

☐ 101 to 150

☐ above 150

temporary employees ^

☐ up to 50

☐ 51 to 100

☐ 101 to 150

☐ above 150

12:29



Worker numbers on site (best estimate totals for 2019)

contractors on site ^

☐ up to 50

☐ 51 to 100

☐ 101 to 150

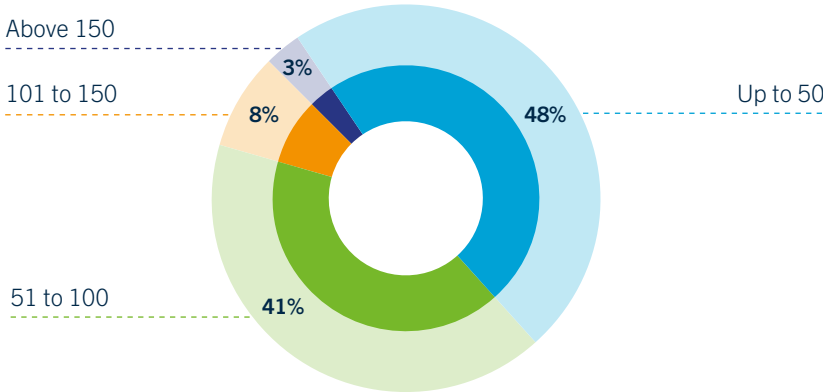
☐ above 150

Actual operating hours in 2019

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Worker numbers on site

Respondents gave the following best estimates for permanent workers on site for 2019:



In almost all responses, best estimates for temporary employees and for contractors on site in 2019 were **up to 50 persons** for each category.

Actual operating hours

Over half of reported operating hours were greater than the theoretical annual maximum of 8760 hours. Clearly, it is not possible for a single shredder to operate for more than 8760 hours in a single year. Of the reported operating hours that were below the annual maximum of 8760 hours, the range was 672 to 2860 hours.

The data for actual operating hours were not usable for the statistical analysis in this report.

12:29 0% Survey Completion 100%

BIR

Make of shredder

▼

- American Pulverizer
- China Resource Newell Equipment - CRNE**
- Danieli - Riverside Products
- Danieli Centro Recycling
- Guangzhou 3E Machinery Co., Ltd
- Hammel
- Harris
- Hubei Lidi
- Jiangsu Huahong Technology Stock Co., Ltd
- Metso-Lindemann
- Newell Industries - The Shredder Company
- Newell Industries Inc.
- Riverside Engineering
- Shandong Shangda Machinery Co., Ltd.
- Sunbelt Technologies
- Texas Shredder Parts Inc.
- Wendt
- Other

Shredder Horsepower

- from 1,000 to 1,999
- from 2,000 to 2,999
- from 3,000 to 3,999
- from 4,000 to 4,999
- from 5,000 to 5,999
- from 6,000 to 6,999
- from 7,000 to 7,999
- from 8,000 to 8,999
- from 9,000 to 9,999
- from 10,000 to 10,999
- from 11,000 to 11,999

← Back → Next

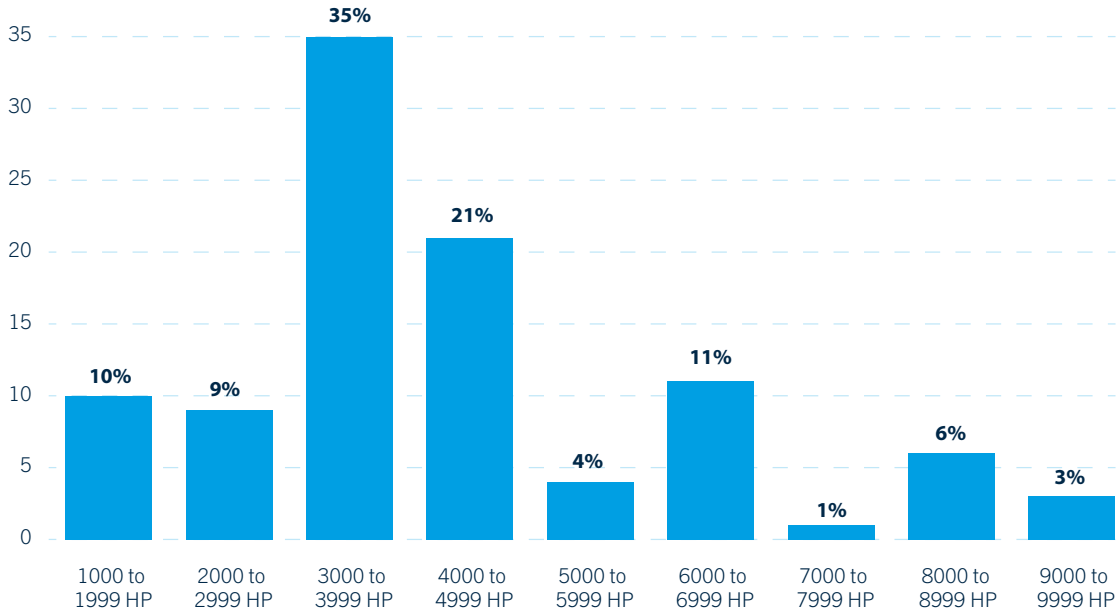
Powered by Qualtrics

Make of shredder

Only some 60% of respondents provided information on makes of shredder and so some makes appear in the sampling to be more numerous. Therefore, trying to determine any relationship between shredder make and incidents was not considered useful.

Shredder horsepower

Similarly, not all respondents provided information on shredder horsepower. Owing to this partial reporting, attempting to determine any relationship between shredder horsepower and accidents was not considered useful.



The BIR Shredder Committee has decided not to include make of shredder or shredder horsepower in future analyses.

CONCLUSIONS

The BIR Shredder Safety Survey 2019 is the first safety survey designed specifically for shredders worldwide and attracted a response rate of some 10%.

As no fatalities were reported by the 10% sample, the fatal work accident rate was zero fatalities per 100,000 full-time equivalent workers. The non-fatal accident rate was 3100 per 100,000 full-time equivalent workers.

The data for accidents by month show that fewer occurred in November, December and January. The data for accidents by day of the month show that more occur at the beginning of the month and three-quarters the way through the month. The data for accidents by time of day show that the most occur between 07.00 hrs and 18.00 hrs, with a reduced rate around lunchtime.

Most accidents were at the material pile, the shredder infeed, at metal separation and at ground level. Accidents were as likely to occur during maintenance as production.

The majority of accidents occurred to full-time employees, with almost as many injured in their first year as in the following two years.

Most injuries took the form of material in eyes, sprains and strains, contusions, lacerations and fractures. Most injuries were to the head and face, eyes, arms, hands and legs. The most common cause of injury was being struck by objects. The next most common cause was “slips, trips and falls”.

Besides vehicle operations, most accidents occurred when maintaining the mill, repairing conveyors and on the picking line. This correlates with the data reported in the section on “Area of shredder where accidents took place”.

As 60% of incidents resulted in no lost time, no fatality and no hospitalisation, the likelihood is that nearly half of accidents were dealt with on site.

RECOMMENDATIONS

Regarding shredder operations:

All shredder-owning and -operating companies around the world are invited to introduce this report and its analyses into their safety briefings for both full-time and temporary employees, as well as contractors on site.

The most common cause of injury was being struck by objects, which may be mitigated by providing mechanical equipment so as to distance personnel from material and by ensuring that, when personnel have to work with machinery and material, the equipment and scrap are not in motion.

Some 25% of accidents are caused by moving vehicles and may be minimised or avoided by having vehicles fitted with sensors and automated collision avoidance.

The next most common cause was “slips, trips and falls”, with the additional relevant information question highlighting the need to be careful on stairways and walkways.

The need for eye protection stands out from this analysis, as well as the need to take care around heavy and sharp objects. The analysis reinforces the need to offer protection in particular for the head (hard-hat), eyes (safety glasses), hands (gloves) and feet (safety boots). Leg protection may also be considered.

The availability of trained first-aiders and of complete, well-maintained first aid kits on site has been highlighted.

Accidents where material penetrated personal protective equipment (eg, sharp items/wire penetrating gloves) show the need for quality PPE. Note when accidents occurred, injuries were more serious when PPE, though available, was not used.

Regarding the BIR Shredder Safety Survey:

Year on year, the BIR Shredder Committee will endeavour to improve the survey and its analyses, and to increase the numbers of shredder-owning and -operating companies that participate.

To increase participation in the survey and thus the response rate, the following actions are recommended:

- Distribute the survey invitation and link through national associations
- Distribute the survey invitation and link through industry journals
- Consider sponsorship for the survey and incentives for continued participation

Recommendations are to delete the survey questions on:

- GPS coordinates
- Company membership of a recycling trade association
- Operating hours
- Make of shredder and shredder horsepower

Recommendations are to add survey questions on:

- Time (eg, daytime/night-time) and weather (eg, rain, hail, snow)
- Deflagrations (ignition of residual liquid fuel or gas in containers)
- Fire incidents and the cause (eg, flames, fuels, batteries)

More precision needed in question regarding worker numbers on site

Investigate ways to authenticate future respondents (eg, using LinkedIn or Google)

BIR SHREDDER SAFETY SURVEY FOR 2020

As can be seen from this report, the promise to maintain the confidentiality of all company-specific data and to respect data protection has been kept. All shredder-owning and -operating companies around the world are invited to introduce this report and its analyses into their safety briefings for both full-time and temporary employees, as well as contractors on site. This report should assist companies in their safety management, along with the BIR Tools for Occupational Health and Safety Management available [here](#).

Various means to distribute the survey for 2020 will be used so that all shredder-owning and -operating companies around the world can participate and maximise the benefits from this initiative.

All shredder owners/operators around the world are invited to supply the email address of their safety manager to Ross Bartley (rbartley@bir.org) so he may maintain contact with them specifically for the purposes of the annual Shredder Safety Survey.

Some companies that responded to the BIR Shredder Safety Survey 2019 had made suggestions regarding the survey. The BIR Shredder Committee took these comments into consideration and, along with other contributions, decided on changes to the survey.

The simplified survey will maintain its effectiveness and will take less time to complete while enabling a year-on-year comparison of safety data.

As well as English, the 2020 survey is available in Chinese, Spanish, French and German.

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