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EXECUTIVE INSIGHTS

New Concepts for a Big Data Safety Strategy

A Big Data Case Study From Owens Corning

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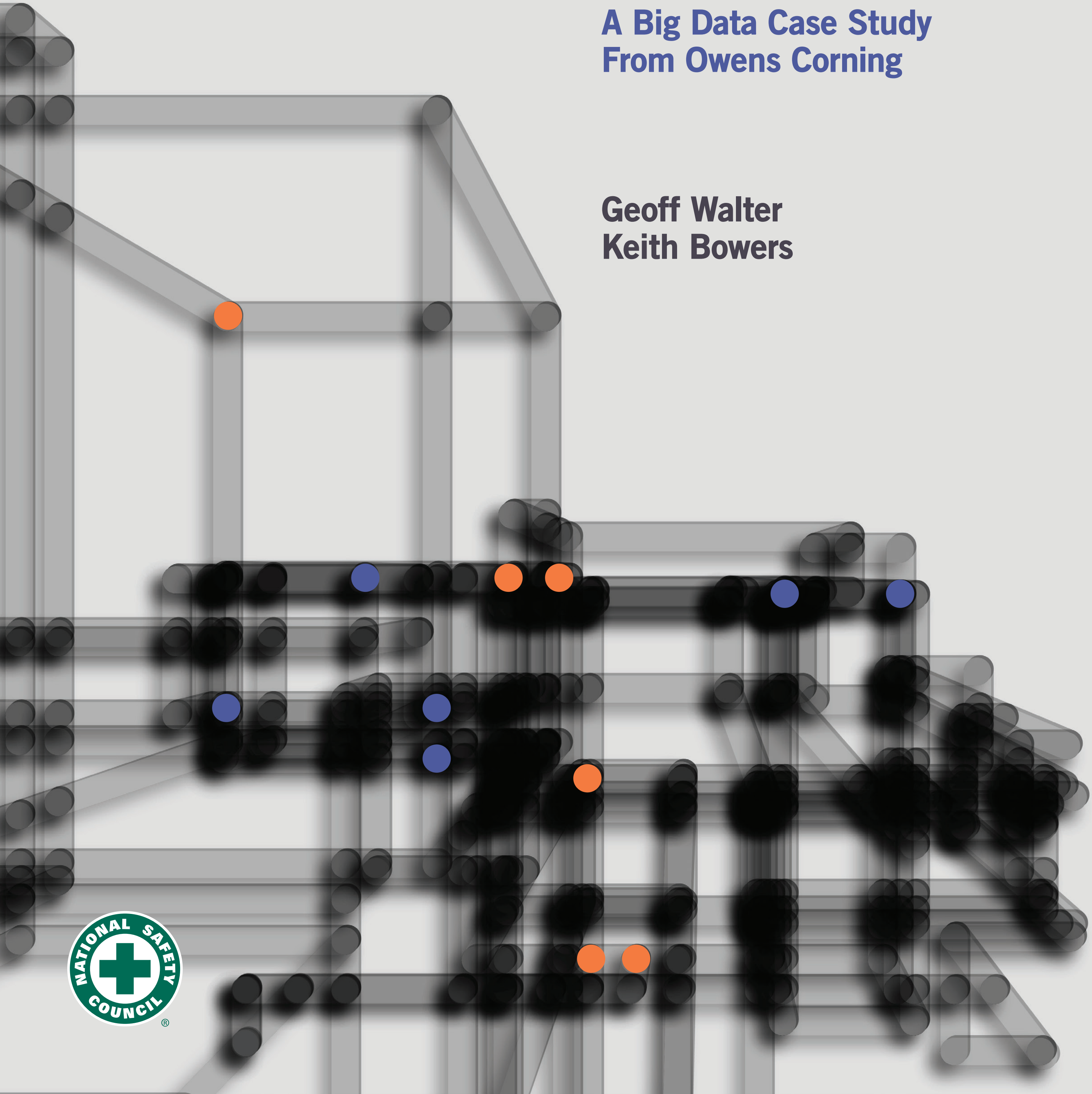

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Contents:

Big Data Tools Help High Performing Company Drive Further Improvement

When Owens Corning sought to reach its year-over-year targets in safety performance, we turned to big data tools, tools that the tech industry had developed, proven, and trusted. We knew our safety performance was good, even notably so, but we looked to big data tools to distill fresh insights from the abundance of data in our safety database, and to generate useful information that would translate to further improvements in safety performance and support our March to Zero.

The integrity and worth of any big data strategy extends no further than the accuracy, completeness, and validity of its underlying data. Fortunately, the careful data collection incorporated into the Owens Corning safety program formed the foundation of our big data strategy. To get started, all we had to do was export that information from our database for analysis.

Using custom software, techniques, and analyses specifically developed for Owens Corning from a series of well-tested machine learning and natural language processing algorithms, we reshaped the Owens Corning database and generated our analysis, graphics, and interactive reporting.

Our Global Safety Strategy includes two complementary components, both created with big data tools. The Incident-Type Risk Profile, the first component, lists detailed Incident Types, specific to the company or division, and ranks them by frequency and severity. The Site Risk Profile, the second component, ranks individual sites based on their underlying long-term safety performance.

Although still in the early stages of implementation, we are gleaning unique, valuable insights from our big data tools. Through converting our vast stores of data into useful information, we have gained confidence that we are identifying the biggest risks, and not getting distracted by the outliers, or those few incidents that might have otherwise stolen our time, attention, and efforts. At Owens Corning, we believe that all accidents are preventable, safety is everyone's responsibility and that working safely is a condition of employment. With a clearly defined and well-conceived data analytics strategy, we are confident that we are focusing on the right areas.

Through converting our vast stores of data into useful information, we have gained confidence that we are identifying the biggest risks, and not getting distracted by the outliers.

Owens Corning's Strong Safety Record

This is a case study with real information from the Owens Corning Composites Solutions Business (CSB), a division of Owens Corning. CSB is a principal producer of structural reinforcing material with factories located worldwide. The site names have been changed in this case study, but the data is real.

Ohio-based Owens Corning has over 100 facilities in 25 countries. Owens Corning develops and produces insulation, roofing, and fiberglass composites. It was formed in 1935 as a partnership between Corning Glass Works and Owens-Illinois and became a separate and independent company in 1938. The company employs approximately 15,000 people around the world and has been a Fortune 500 company every year since the list was created in 1955.

In 2014, the National Safety Council awarded Owens Corning the Green Cross for Safety medal. Also, for the last seven years, Owens Corning has been recognized on the Dow Jones Sustainability World Index.Owens Corning has built a strong safety culture that emphasizes continuous improvement.

The incident rate history for Owens Corning, shown in Figure 1, demonstrates consistent improvement in incident rates over time. However, in recent years, we have reached a lower threshold, and we have struggled to further decrease our incident rates below this level. A driving force behind our move to big data tools has been a desire to continue improving our safety culture and performance even though we have attained these industry-leading low incident rates.

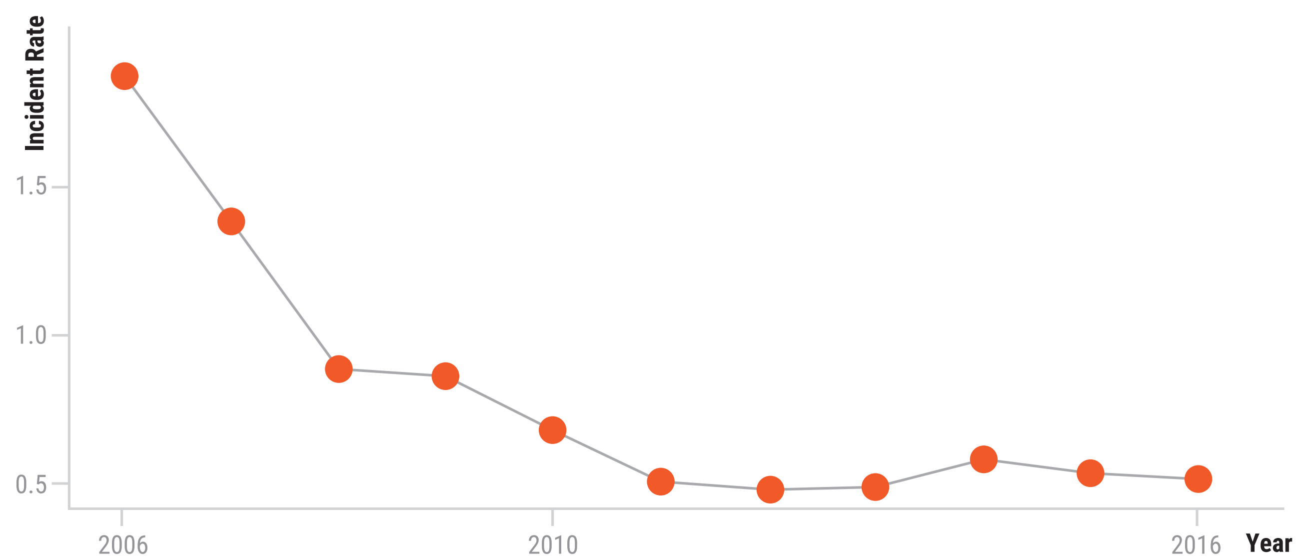


Figure 1
Owens Corning Incident Rate History, 2006 to 2016

Annual Incident Rates for Owens Corning from 2006 to 2016. Maintaining strong year-over-year improvement has become increasingly difficult as incident rates have declined.

BEFORE: **Too Much Data, Not Enough Information**	AFTER: **Data Analytics Drive Meaningful Analyses and Conclusions**
Generated colossal amounts of data that was impossible to analyze thoroughly and difficult to draw conclusions from.	Machine Learning and Natural Language Processing consider all data currently housed in our safety database, i.e., all text and numeric information from all years.
Focused on general, industry-wide risks in broad categories.	Incorporating actionable, customized and detailed Incident Types.
Prioritized site-by-site efforts chiefly based on recent site incident rates.	Prioritizing site-by-site efforts based on all relevant site information, including incident rates.
Despite these shortcomings, we achieved award-winning safety performance.	Striving for even higher levels of safety performance, big data techniques aid decision-making by safety leaders.

Table 1

Before and After Adopting a Big Data Approach

Before and after, comparing our multi-site safety strategy, with and without an advanced data analytics program.

Global Safety Strategy Combines Incident Type and Site Risk Profiles

Global Safety Strategy is the term we use for the data-driven priorities for safety improvement efforts at all levels of a global company: the incident level, the site level and the division or company-wide level.

The Global Safety Strategy includes two components: an Incident-Type Risk Profile and a Site Risk Profile. The Incident-Type Risk Profile indicates the specific kinds of incidents on which we should focus. The Site Risk Profile identifies which sites (individual plant or factory locations) need the most improvement. Incorporating these components, the resulting Global Safety Strategy provides plentiful and detailed information that guides our safety efforts for maximum benefit because it is uniquely customized to our business and its practices.

Before big data tools, we used standard tabulations of drop-down selections and general groupings of incidents.

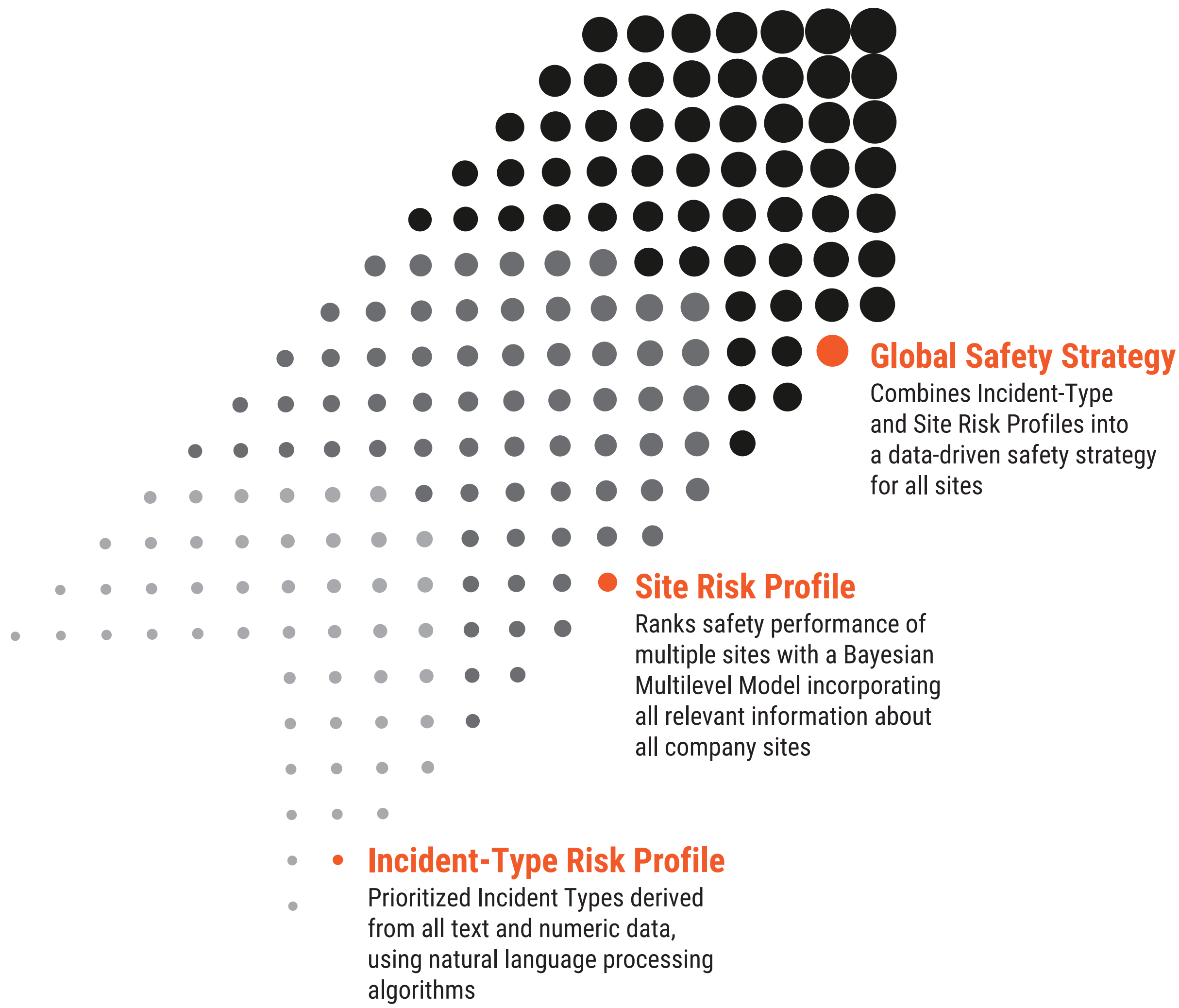


Figure 2

Global Safety Strategy Development with Big Data Techniques

Risk Profile Process for high-performing safety programs. We used big data technologies to analyze all text and numeric information to develop a custom safety strategy.

Limitations of Our Previous Approach Motivated the Move to Big Data Tools

The countless reams and bytes of data that make up our safety records overwhelmed our team when we sought to distill insights from them. For incident reporting alone, the Owens Corning CSB safety database contains over 6,000 detailed reports, which included over 300,000 words. We knew we needed big data technology to approach and analyze our carefully prepared trove of data.Before big data tools, we used standard tabulations of drop-down selections and general groupings of incidents, like the safety database summary presented in Table 2, which reflects actual Owens Corning CSB information.

INCIDENT TYPE DESCRIPTION	% RECORDABLES
Foreign body	13%
Other or unclassified	10%
Struck by	10%
Struck against (by person, not including falls)	7%
Falls, slips, trips, same level	6%
Caught in, under, between	5%

Table 2

Previous Approach, Owens Corning CSB Database Summary Table

Our previous approach. A typical Safety Database Summary table.

Global Safety Strategy Guides Our Efforts for Maximum Improvement

At Owens Corning CSB, we developed a big data Global Safety Strategy because, without it, we risked working on the wrong things, and wasting our resources.

We recognize several common factors that complicate the effective deployment of our resources. At high performing companies, serious incidents are relatively infrequent; so, we tend to work on whatever significant and memorable incident happened last. For example, if a traffic accident happened to be the most recent serious incident, we would likely see an emphasis on traffic safety in the next iteration of the safety strategy. Psychologists call this the Recency Effect. Unfortunately, recent and memorable events are not always or necessarily the type of event that most deserves our effort and action.

Our normal human tendency to follow the Path of Least Resistance drives us to dedicate our work toward areas or topics where we are most comfortable. For example, if I have had repeated success implementing hand injury reduction programs, I will be inclined to implement another hand injury reduction program next year. Unfortunately, the Path of Least Resistance is not necessarily the path deserving of our attention. Without precise guidance from real data, it is very difficult to focus our efforts on the most pertinent and timely Incident Types from the millions of possible types that can occur in the workplace.

The remedy to the Recency Effect and the Path of Least Resistance is to develop a Global Safety Strategy based on company-specific incident and site information.

The experience and good judgement of capable safety professionals is crucial to the effective implementation of this big data methodology. For example, if we add a new product line with very different manufacturing processes, information from older, dissimilar processes will not serve as a good guide in developing an effective safety program. The experience, expertise, and insights of good safety professionals remain irreplaceable. These tools are designed to aid, not replace, careful decision making by safety professionals.

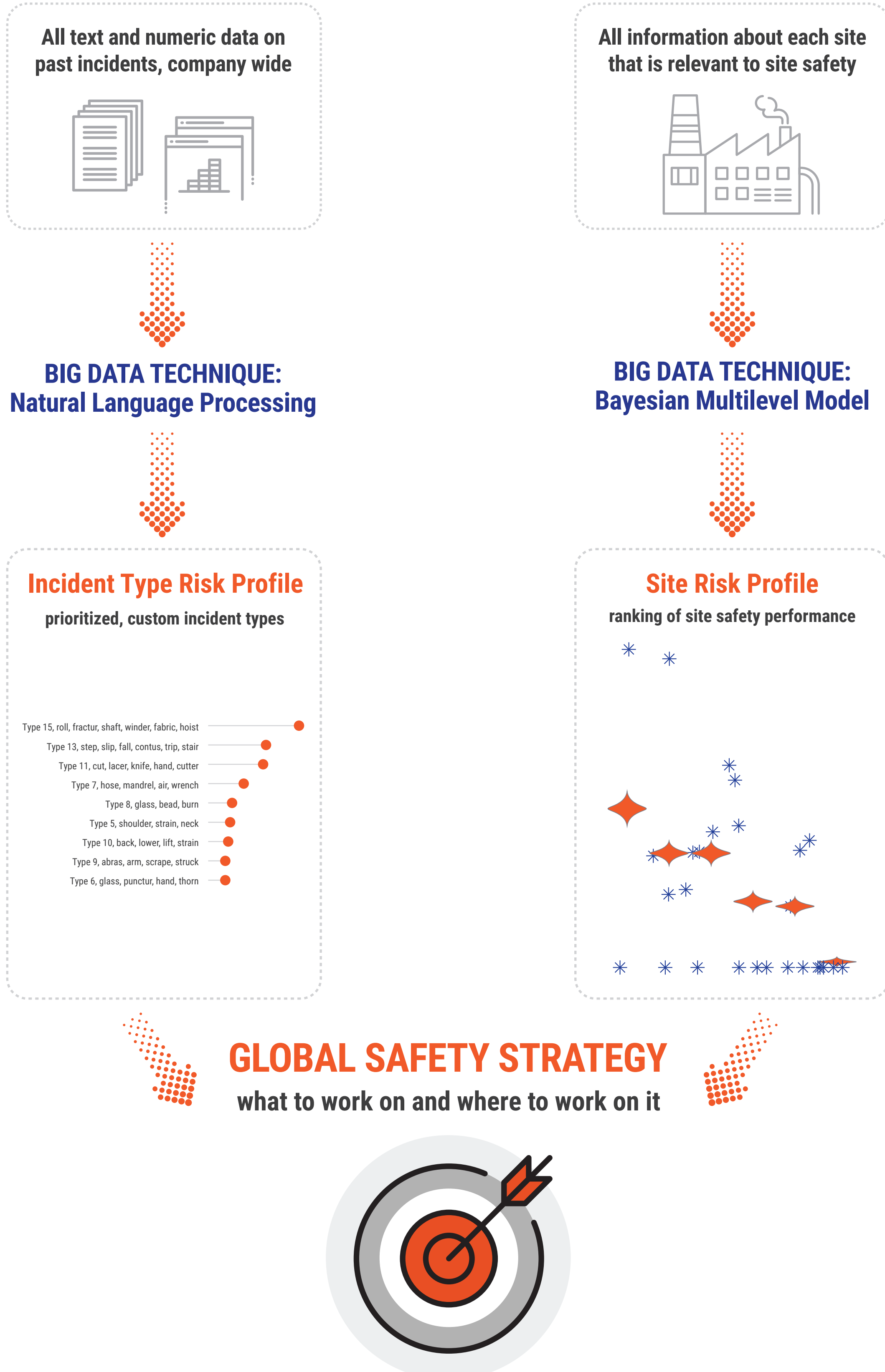


Figure 3

Big Data Approach to Developing a Global Safety Strategy

Global Safety Strategy process. The Incident-Type Risk Profile (left) is a summary classification and ranking of all incidents reported in the Owens Corning CSB database. The Site Risk Profile (right) is a big data ranking of site safety performance. The two risk profiles are combined into a Global Safety Strategy (bottom) that provides specific guidance to maximize safety improvements. The small red and blue graphics above are reproduced in a larger size with explanation in Figure 6 and Figure 9.

Incident Type Risk Profile Is a Classification and Ranking of All Previous Incidents

The Incident-Type Risk Profile summarizes, delineates and prioritizes all incident reports in the Owens Corning CSB database. To produce our Incident-Type Risk Profile, a series of natural language processing and machine learning algorithms condensed and categorized all our safety reports and related information to produce a detailed set of custom Incident Types. These Incident Types are unambiguous and unique to our company since they were created from our safety logs and records.

To arrive at our list of Incident Types, we consolidate the entirety of the information contained within our safety database, including incident descriptions, root cause corrective action reports, drop-down box selections, and numeric data such as OSHA recordable rates and lost work day counts. At Owens Corning CSB, we also carefully collect information on the near-miss and first aid cases included within our safety database. In creating a more robust list of Incident Types, we found the near-miss and first aid reports very helpful, as they provide examples of unsafe behavior that are not always captured in other reports.

These Incident Types are very specific and unique to our company since they were created from our own safety logs and records.

Incident Type 15, an Example of a High-Impact Incident Type

The highest impact Incident Type for Owens Corning CSB, as ranked by the number of OSHA Recordable incidents, involves large rolls of fiberglass reinforcing fabric contacting employees. These fiberglass rolls can be quite heavy, often as much as 900 pounds (400 kg). Most of these incidents involve contact during manipulation of the rolls by the winding machine operators, but some involve employees loading or transporting these large rolls of fabric. Figure 4 contains a word cloud of key terms used in describing these incidents, drawn from the text of actual Owens Corning CSB incident reports. In this illustration, we represent the words that appeared most frequently in Incident Type 15 reports in larger-sized fonts, and those appearing less frequently in smaller text. Note that we have shortened the words to simple root forms to aid in processing; for example, “oper” can stand for operator, operators or operate.

Table 3 contains excerpts from Owens Corning CSB database reports classified as Incident Type 15. Note that the incidents range in severity from a minor finger pinch to a serious leg injury that led to over six months of lost work time.

Previous approaches would not have recognized the commonality among the four incidents shown in Table 3. The Risk Profiling process produces large numbers of example incident reports for each Incident Type. We found that using real incident reports from our safety database for each Incident Type facilitates the development of detailed and effective incident reduction plans.

Figure 4
Incident Type 15

A word cloud of key terms for Incident Type 15. Larger-sized words appear more frequently than smaller-sized words in incident logs associated with this Incident Type. The words are shortened to their root to aid natural language processing. For example, “oper” is the root for operator, operated, and operate. Incident Type 15 is one of the summary categories distilled from all of the incidents reported in the Owens Corning database.

LOST WORK DAYS	EXCERPTS FROM SAFETY DATABASE FOR INCIDENT TYPE 15
0	**…her finger was held in between two rolls placed horizontally. Entrapment between roll of finished product (about 26kg) already on the pallet and the one the operator placed. Avulsion Finger(s).** CASE 353XXX
180	**Two employees were packing fabrics rolls on a pallet … roll struck against her right lower leg … A fabric roll(~395kg) with an expansion doffing shaft(~50kg). Fracture Leg, Right.** CASE 396XXX
24	**After finishing a 100 m roll, she used the hoist to take out the shaft. Since the shaft swung, she tried to stop the movement by holding the sling … hand got bumped against the metal frame of the winding station. Laceration, open wound Hand, right.** CASE 378XXX
3	**… moving the roll of a final product from the machine to the pallet through a hoist … fingers of the operator were catch between the mandrel and the sling used to move up the roll with the mandrel from the machine by a hoist. Laceration, open wound Finger(s).** CASE 355XXX

Table 3
Selected Case Reports for Owens Corning CSB Incident Type 15

Excerpts from actual incidents in our safety database that were classified by big data tools as Incident Type 15. This incident type concerns impacts between winding machine operators and large, heavy rolls of material. Previous approaches would not have recognized the commonality among these four incidents. We found that using real incident reports from our safety database and linking these reports to each Incident Type makes it easier to develop effective countermeasures.

Incident Type Network Shows Interrelationships Between Incident Types

Figure 5 presents a network diagram of Owens Corning CSB Incident Types and their interrelationships. The Incident Types are naturally clustered into four main groups that are outlined with blue boxes: machine impacts, slips and falls, strains, and hand injuries. Each of these groups is composed of the specific Incident Types shown. The highest impact Incident Type in each cluster is underlined.

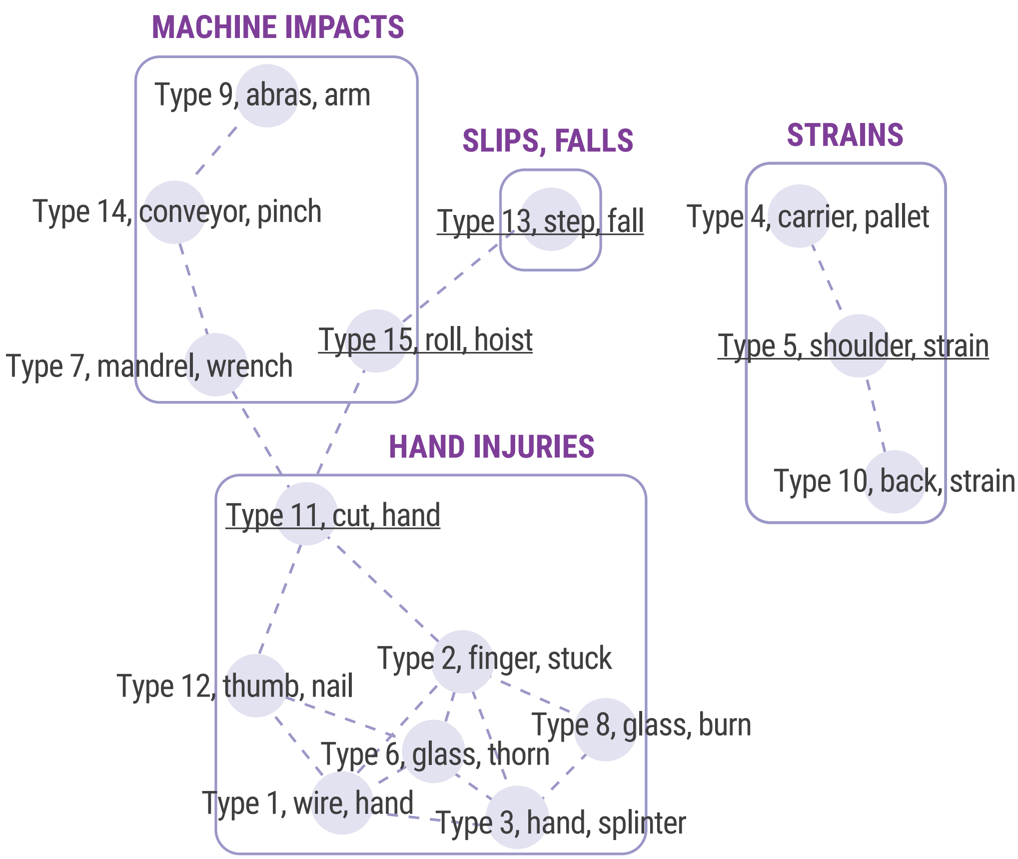


Figure 5

Network Diagram of Owens Corning CSB Incident Types

Network of the Incident Types in the Owens Corning CSB safety database, as produced by big data techniques. The database consists of 6,228 incident records and 305,287 words of text. Each Incident Type is labeled with key words that are characteristic for that Incident Type. The dotted lines represent stronger similarity between the Incident Types. The highest impact Incident Type in each group is underlined. Note that the Incident Types are very specific to our company operations and naturally fall into four broad categories. This network helps to visualize the natural groupings of the Incident Types and design a systematic incident reduction plan.

Incident Type Risk Profile Is a Data-Based Ranking of Custom Incident Types

Which Incident Types should receive our attention? Which should we try most to prevent? We find that the best place to answer those questions is our safety database, which we use to select and prioritize Incident Types.

Figure 6 portrays the Owens Corning CSB Incident Types ranked by the number of OSHA Recordable Incidents and Lost or Restricted Work Day totals. These graphs make it easy to prioritize Incident Types and develop a safety strategy. We can replot them by business subgroup and site, as needed, when we devise subgroup and site-level strategies. These plots cover a seven-year period, but do not capture trends over time; therefore, plots for the frequency of key Incident Types over time are produced as needed. Incident Type 13, slips and falls, and Incident Type 15, product roll impacts, have historically had the highest recordables and lost work day totals for Owens Corning CSB. We also conduct a similar analysis at other levels of the organization. We can break down these Incident Types into smaller subtypes, if needed, to design better countermeasures. For example, Incident Type 13 concerns several varieties of slips, trips and falls, each calling for different prevention tactics. We broke Incident Type 13 into three subcategories using big data methods. The first subtype involves slipping on wet surfaces, including forklifts slipping on wet floors. The second subtype involves falling down stairs or falling off an elevated platform, often a machine operator's platform. The third subtype concerns slipping on icy surfaces or tripping over debris or uneven surfaces.

Figure 6

Incident-Type Risk Profile for Owens Corning CSB Incident Types

Incident-Type Risk Profile: Ranking Incident Types by frequency and severity for seven years and over 110 million work hours. Incident Types are labelled by their key words and ranked by the total number of OSHA Recordable Incidents (Recordables) and Lost or Restricted Work Days (Lost Days) per Incident Type. This analysis enables an impact-based ranking of Incident Types. Incident Types can be broken down into subtypes when needed. For example, Incident Type 13 was divided into three subtypes to facilitate the design of countermeasures.

Incident Rates Alone Are Not Enough To Rank Site Safety Performance

At high performing companies, incident rates alone fail to fully gauge relative site safety performance. How can we effectively allocate our safety efforts across our sites if we do not fully understand where our efforts are most needed? The simple answer – we cannot. Sophisticated big data tools go a long way in helping us understand where and to what degree our safety labor is needed. For example, with the information provided through a thorough and complete analysis of our incident rate and other site-specific data, we can target lower-performing sites for more audits and more improvement programs. After all, we don't want to squander our improvement efforts where they aren't needed.

To demonstrate the difficulty of ranking site performance at low incident rates, we coded a computer simulation, shown in Figure 7. The red, blue and green lines represent three different manufacturing sites with varying safety performance levels. The sites on the left side of Figure 7 each have higher incident rates (10, 18 and 20) than the sites on the right side (1.0, 1.8 and 2.0). What's unclear, and not readily apparent in this example, is that it's the red site that has the highest long-term underlying incident rate, on both plots shown in Figure 7. But, that information gets lost in the noise of the data.

In Figure 7, the true underlying incident rate actually remains constant over the five-year period, but measurement variation (noise) causes a few points of year-to-year variation in site incident rates. For the higher incident rates shown on the left, despite the year-to-year noise, we can still adequately rank the sites. It's on the right side, for those sites with the lower incident rates, that it grows difficult to produce an accurate ranking. There's just too much noise.

Figure 7

Difficult to Rank Site Performance at Low Incident Rates

Which site needs the greatest attention? The red, blue and green lines represent the safety performance history for three different manufacturing sites, with high incident rates on the left and lower incident rates on the right. On the left, the red site has the worst long-term performance with the highest incident rates overall. For the sites with lower incident rates on the right side, it is difficult to determine which site needs the greatest attention.

In Figure 8, we present eight years of annual incident rates from an Owens Corning CSB business unit, consisting of six sites with very similar production processes and identical products. Note the resemblance between the actual rates in Figure 8 and our simulated rates in the right panel of Figure 7. In both cases, low incident rates make it very difficult to determine the effectiveness of each site's safety programs, and to properly, and confidently, allocate safety team resources. (The site names have been changed for this case study, but the numbers are genuine.)

This statistical variation, i.e., noise, in periodic incident rate reports can get in the way when we try to identify and focus on the sites with the weakest underlying safety cultures. If we concentrate the resources of our safety team on whichever site had the highest incident rate as of last report, we can end up changing site priorities with each new report, rather than focusing our energies on lasting improvement.

Figure 8

Which Sites have the Best and Worst Performance?

Safety Incident Rates for a business unit with six very similar sites. Which site demands the greatest attention? Note the similarity to the right side of Figure 7. If we prioritize whichever site has the highest recent incident rate, we change course with every new report. It takes more than annual incident rate information to reliably prioritize site safety improvement efforts at high performing companies.

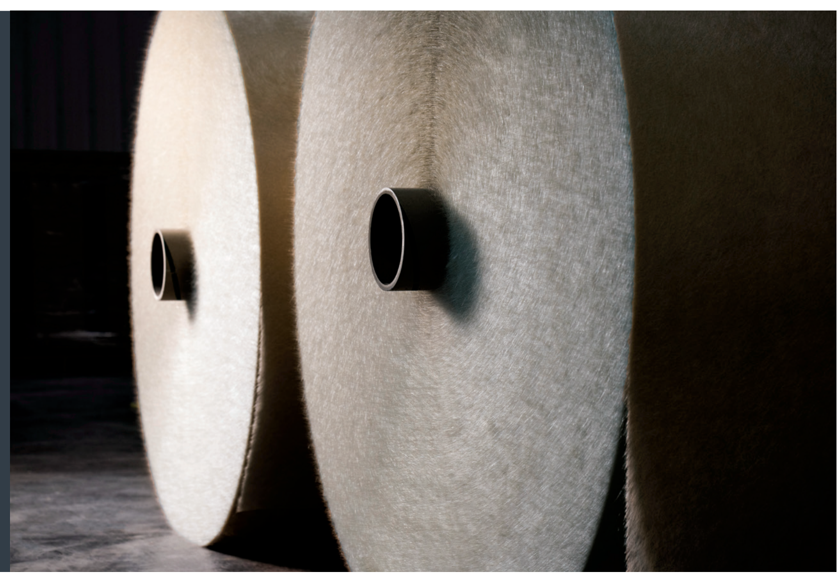
Site Risk Profile Uses a Complex Computer Model to Reliably Rank Site Safety Performance

We used a powerful Bayesian multilevel model to derive a mathematically valid estimate of the true underlying incident rate for each site. The Bayesian multilevel model was built with extensive information from all Owens Corning sites, spanning over 110 sites in thirteen business units, and covering over 230 million work hours. The model calculates better answers by incorporating multiple sources of information and by pooling information to reduce noise.

The Owens Corning Bayesian multilevel model considers which products are made at each of our sites, the region of the world where they are located (e.g. Asia or Europe), whether each site is mostly factory space or office space, and other site-specific information, including total hours worked. The Bayesian multilevel model can also consider audit results, lost work day data, or any other factor chosen by the user from a set of existing leading or lagging indicators. Figure 9 presents the output of our Bayesian multilevel model; it plots model estimates and annual incident rates for the business unit with six very similar sites that were shown first in Figure 8. The orange shapes represent the true underlying safety performance at each of our six sites, as estimated by our multilevel model. The orange shapes are widest where the true underlying incident rate most likely resides. For example, the Mountain Center site (the site names have been changed, but the information is real) has a true incident rate that is slightly below two. The blue stars are the same annual incident rates that are presented by year in Figure 8.

We use the model output to help prioritize safety efforts at the sites and generate our Site Risk Profile. By using more than just the incident rate to get a better estimate of site performance, the Bayesian multilevel model allows us to more accurately rank the sites and direct our safety team resources to the sites with the weakest underlying safety processes. The model reduces noise and provides a steadier signal to steer our site-level strategy.

The model calculates better answers by incorporating multiple sources of information and by pooling information to reduce noise.



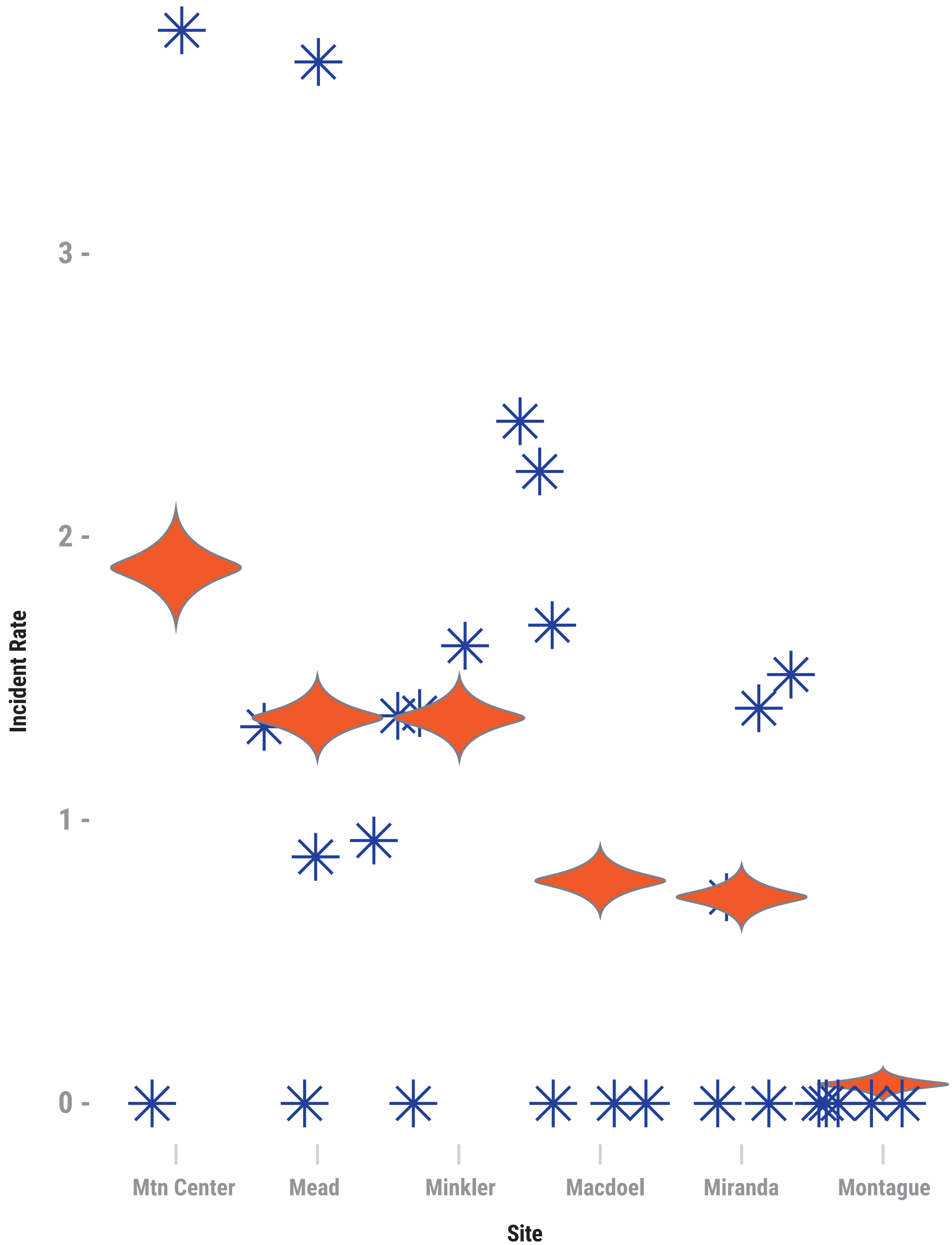


Figure 9

Site Risk Profile Prioritizes Site Improvement Efforts

Site Risk Profile for a business unit with six very similar sites. (Lower and flatter is better.) This is a small excerpt from the larger Owens Corning Bayesian Multilevel Model that incorporates over 230 million work hours from over 110 sites and multiple sources of information about each site. The orange shapes are widest where true incident rates most likely fall. For example, the Mead and Minkler sites have estimated long-term incident rates of about 1.4. The blue stars plot the annual incident rates that are also plotted by year on Figure 8. The model reduces noise and provides steadier guidance to help steer our site-level strategy.

STEP	ACTION	BIG DATA TECHNIQUE	RESULTS/BENEFITS
1st Step	**Incident-Type Risk Profile**: Determine custom Incident Types based on all written records and rank Incident Types based on frequency and severity.	**Natural Language Processing: Algorithms** that use all the text in the safety database, including incident logs, RCCA reports, near miss and first aid reports. Recordable and Lost Work Day totals are used to assess the impact of each Incident Type.	**Detailed Incident Types**: Incident Types specific to our company and processes. Ranked and prioritized by impact. **Detailed real-life reports** linked to each Incident Type make it easier to develop countermeasures.
2nd Step	**Site Risk Profile**: Determine and rank safety performance for each manufacturing site, using incident rate and other pertinent information about each site.	**Bayesian Multilevel Model** that can take advantage of all we know about the different sites, including: audit results, incident rates, factory type, size and geographic region.	**Better understanding and ranking** of the site safety performance at each site. **Prioritize audits and countermeasures**. Implement site-specific risk mitigation programs, where needed.
3rd Step	**Compile Global Safety Strategy** to allocate efforts and help design safety programs.	**Same as above**, and other special models, as needed.	**Data-Based Safety Strategy**: where to work and what to work on to maximize safety improvement.

Table 4
Global Safety Strategy Development, Step by Step

Overview of Global Safety Strategy development. The strategy utilizes big data and natural language processing techniques to read all existing information and develop a company-specific Global Safety Strategy. This process is designed for high-performing safety programs that want to attain the next level of safety excellence.

We executed the techniques and analyses detailed in this case study using software specifically developed for Owens Corning from a series of well-tested machine learning and natural language processing algorithms.

The Importance of Safety Expertise in Obtaining Good Results From Big Data Tools

By now, you may be asking how Owens Corning obtained or developed the software used in executing these big data techniques and delivering these analyses. For the techniques and analyses detailed in this case study, we developed software specifically for Owens Corning from a series of well-tested machine learning and natural language algorithms that were developed by major universities, using a statistical programming language. We used this custom computer code to reshape the Owens Corning database output into a suitable form and to operate the machine learning and natural language processing algorithms that we used to generate our analyses, graphics, and interactive reports.

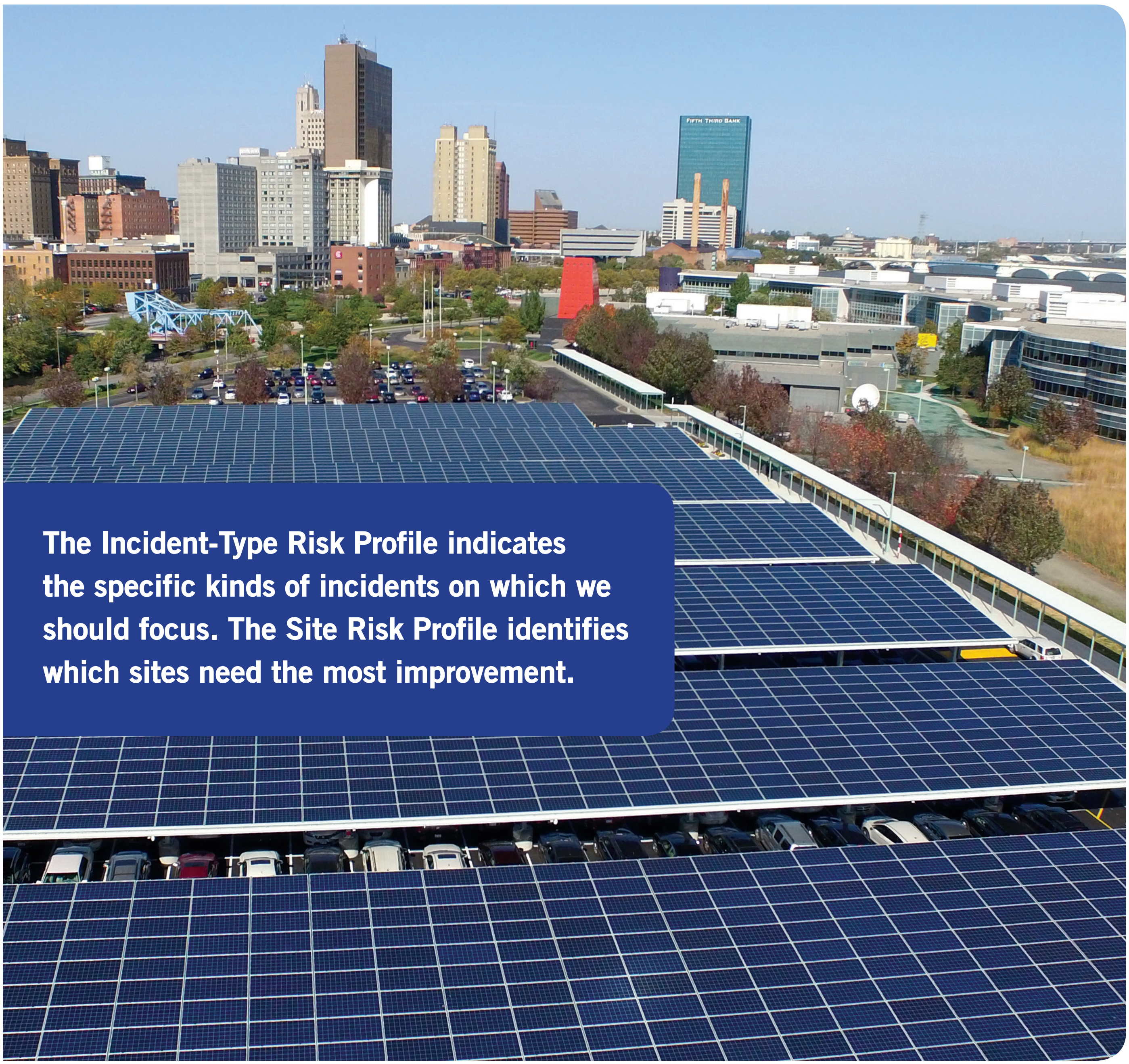
Safety expertise and professional judgment is crucial to the successful application of the big data techniques used to mine and analyze data. For example, EHS experience is key when recognizing which Incident Types are useful and meaningful. While big data tools are very powerful, they are useless for this sort of sophisticated domain-specific analysis without also injecting real-world safety expertise into our data analysis procedures.

While big data tools are very powerful, they are useless for this sort of sophisticated domain-specific analysis without also injecting real-world safety expertise into our data analysis procedures.

Global Safety Strategy Combines Site-Level and Incident-Type Risk Profiles

The Global Safety Strategy combines the Incident-Type Risk Profile and the Site Risk Profile, as shown in Table 4. We prioritize and rank the Incident Types first, and site safety performance next. The resulting Global Safety Strategy helps us to direct our resources to the Incident Types and sites that will produce the greatest improvement for the safety effort invested.

Figure 10 graphically presents the development of the Global Safety Strategy for the business unit with six very similar sites we saw in Figures 8 and 9. Figure 10 combines the site-level and Incident-Type Risk Profiles into a coherent strategy.



The Incident-Type Risk Profile indicates the specific kinds of incidents on which we should focus. The Site Risk Profile identifies which sites need the most improvement.

Site Risk Profile

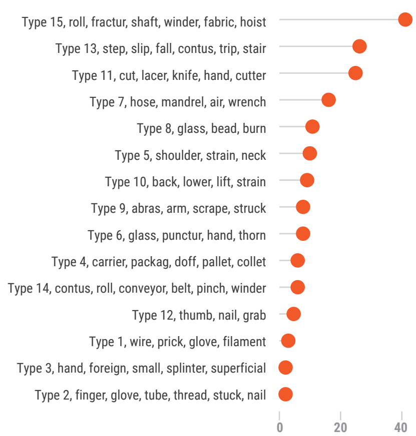
Priority	Site Name
1st	Mtn Center
2nd	Mead
3rd	Minkler
4th	Miranda

Incident-Type Risk Profile

Priority	Incident Type
1st	Type 15; roll, fracture, shaft, winder
2nd	Type 1; step, slip, fall, contusion
3rd	Type 5; shoulder, strain, neck

Incident Type 15 Information

Incident Impact



Key Words

Case Reports

Figure 10

Tools to Develop Effective, Data-Based Corrective Actions

Global Safety Strategy excerpt for the business unit with six very similar sites seen above in Figures 8 and 9. Clockwise from top left: selection from a prioritized ranking of sites from greatest need of safety improvement to least in need of improvement, selection from a prioritized ranking of Incident Types, and a graphic representation of some of the descriptive information available for Incident Type 15.

Conclusion

At Owens Corning CSB, we are accelerating our continuous safety improvement with the help of big data methods. This approach has provided us with fresh insights into better ways to further reduce incidents at our facilities around the world.

We used these powerful analytical tools on our existing safety information to generate a Global Safety Strategy for Owens Corning CSB. The Global Safety Strategy is composed of two parts, an Incident-Type Risk Profile and a Site Risk Profile.

The Incident-Type Risk Profile represents a distillation and classification of all our previous incident reports and associated safety documents into a set of Incident Types exclusive to Owens Corning CSB. These custom Incident Types were then ranked from highest to lowest impact based upon recordable incident and lost work day counts. The Incident Types are very detailed and are also linked to many of our actual incident reports, which facilitates the design of specific countermeasures. The Site Risk Profile contains an ordered list of all the active sites for our company, rated from best long-term safety performance to worst. For high-performing companies like ours, determining relative site safety performance is difficult because the low underlying incident rates are often overwhelmed by measurement variation or noise. The Site Risk Profile is generated by a large and complex Bayesian multilevel model that uses more than just past incident rates for each site – it uses all the relevant information we have about each site to provide a more reliable and accurate estimate of site safety performance. This site ranking guides our strategy and helps us to allocate our safety resources where they will make the most effective and efficient improvements.

We executed the techniques and analyses detailed in this case study using software specifically developed for Owens Corning from a series of well-tested machine learning and natural language algorithms, developed by major universities. We used a statistical programming language to conduct these analyses, to reshape the Owens Corning database output, to operate the machine learning and natural language processing algorithms and to generate our analyses, graphics, and interactive reports.

In this case study, we analyzed the Owens Corning CSB safety database with big data tools and now we are looking at other ways to apply these and related techniques. For example, Natural Language Processing could be used to classify and analyze the reams of text produced by behavior-based safety systems. There is still room for more innovation, and we think that big data analytical tools will play an important and growing role in the future of industrial safety at high-performing companies.

The data-driven Global Safety Strategy revealed in this case study helps set the agenda and frees our safety team to do what they do best – develop countermeasures, engage employees at all levels of the organization, influence behavior and build a stronger safety culture for a better workplace.

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About the Authors

Geoff Walter is Corporate Director of Enterprise Safety for Owens Corning. In this leadership role, he has responsibility for leading and managing the global safety function for Owens Corning which includes developing and implementing the strategy, policy, processes, systems and tactics to deliver world class safety performance for Owens Corning, in pursuit of injury free lives for employees at work and outside of work.

Mr. Walter joined Owens Corning in June 2014. Prior to joining Owens Corning, he spent 19 years with Honeywell International in various roles of increasing EHS responsibilities within the Aerospace, Automation & Control Solutions and Transportation business units as well as their Corporate EHS organization. Mr. Walter also spent 6 years working in various EHS roles with General Electric and two Texaco joint ventures.

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Keith Bowers uses big data tools to help Safety Leaders develop effective corrective actions. Before founding Bowers Management Analytics, Keith spent two decades with Honeywell in diverse EH&S and ISC roles where he gained the domain knowledge needed to successfully apply big data tools. Keith earned a BA from Colgate University, an MS from Texas A&M University and an MBA from Arizona State University. Keith's certifications include Six Sigma Black Belt, PMP, and a Data Science Certificate from Johns Hopkins University.

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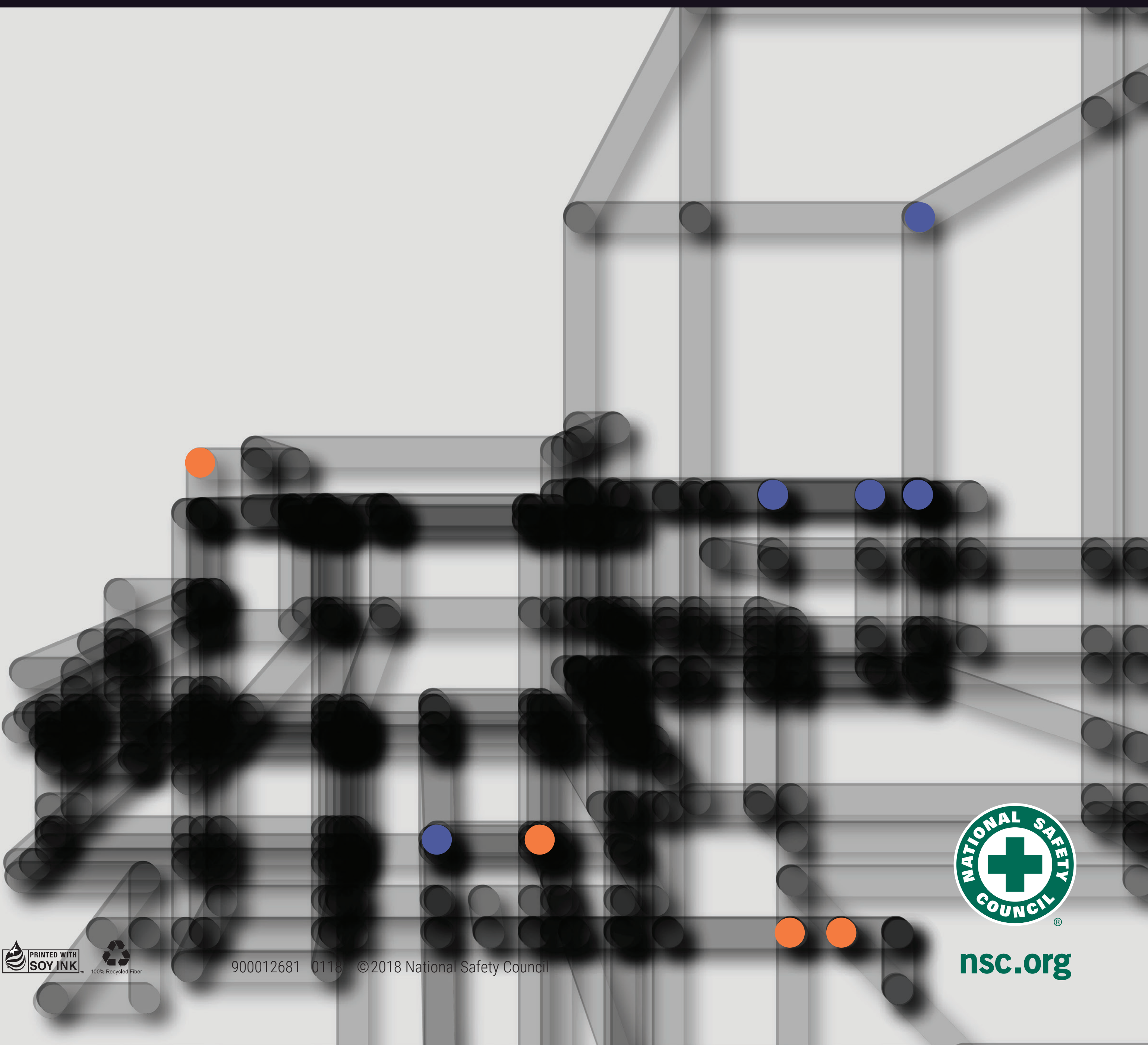

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