October 2015

Today's Industrial Products & Solutions™

The Complete Purchasing Guide for Today's Industrial Market

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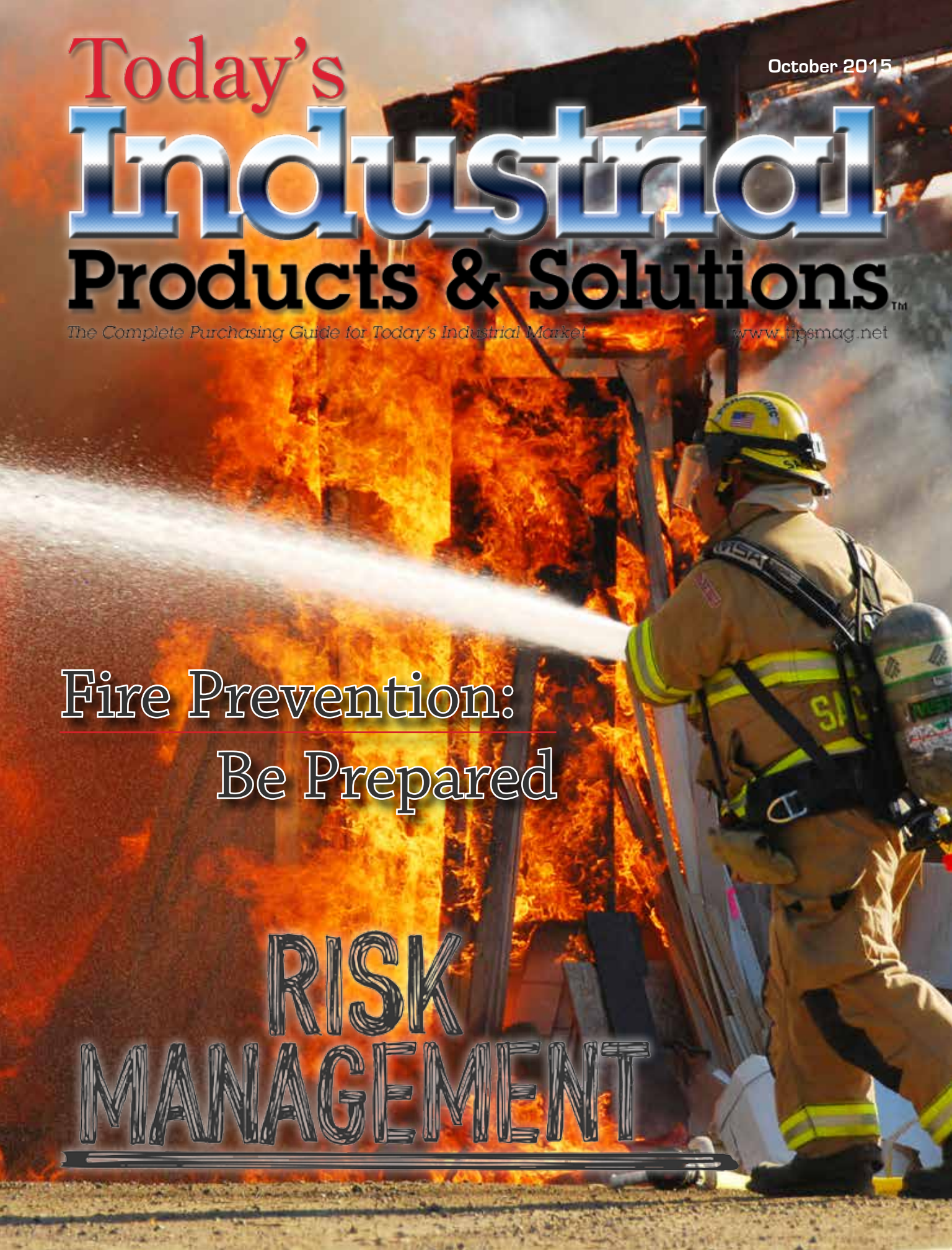

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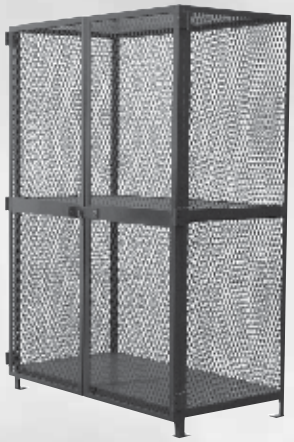

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Fire Prevention:

Be Prepared

By Glen Hobson

Recently, my family and I were wakened at 1:30 in the morning by police to evacuate our house because our neighbor's house was in flames. The fire department feared that it would spread to our house. The neighbor's house was a total loss. Luckily, the gentleman who lived there was out of town so no one was injured.

In an instant, I realized how you can lose everything. With October being Fire prevention month, it's a good time to make sure you are ready in the event that something should happen. The following is a list of things that causes factory fires:

1. Faulty Electrics

Faulty electrics are the biggest cause of workplace fires, loose wires, plugs that are over loaded and old equipment can all make for a potential death trap. Every workplace is legally obliged to take good care of any electric al equipment, and Portable Appliance Testing (PAT) is an absolute must. These tests, undertaken every year, will ensure that your electrical goods stay in good working order and are fit for purpose.

2. Flammable and Combustible Materials

Flammable and combustible materials represent a dangerous hazard to your employees as well as your business; while every workplace should place fire safety at the forefront of their risk assessments, this is particularly true of premises that hold any number of materials that are flammable or combustible. Appropriate storage, correct disposal and in-depth processes for handling these materials and or substances should be put in place.

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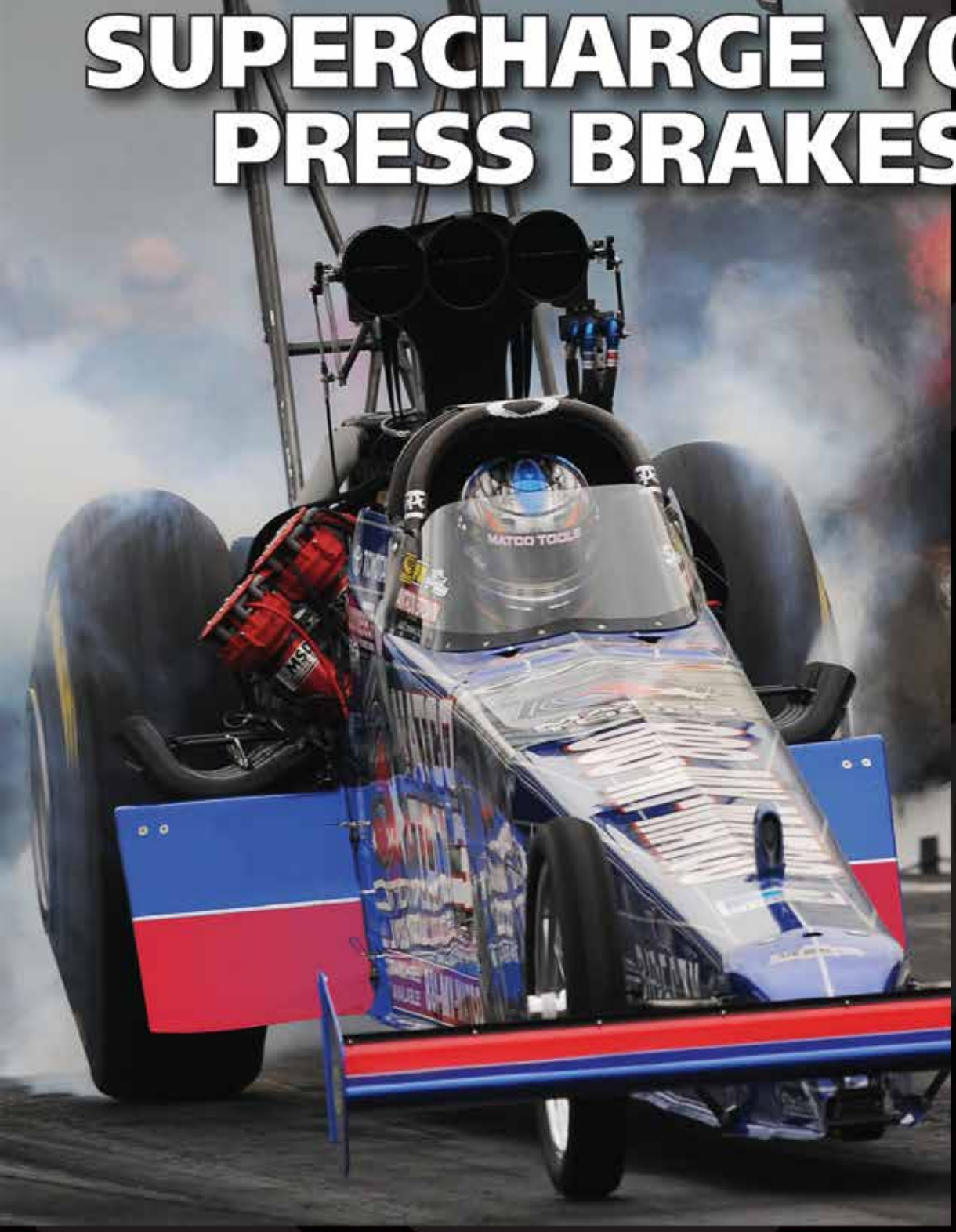

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3. Human Error

Another common reason for fires in the workplace is down to human error, accidents such as knocking liquid onto electrical equipment, burning food in the kitchen or spilling flammable or combustible liquids.

4. Negligence

Negligence can be differentiated from human error by the fact that such incidents are caused by proper procedures not being followed, or a member of staff undertaking an activity known as a potential fire hazard. Such instances are, again, easily avoided, and staff training on the dangers of certain areas within the workplace cannot be underestimated.

Common examples of negligence include stacking or partially covering electrical equipment that requires air, improperly storing flammable items (including paper) and not following proper precautions for the handling of substances.

5. Arson

While many may get alarmed when they hear that arson is a common cause of workplace fires, it's indeed a relatively frequent occurrence. Factories and industrial estates are particularly prone to vandals and fires can spread quickly from unit to unit if proper fire control features aren't installed.

If suitable, work places should fit fireproof shutters and a water sprinkler system to protect their property as far as possible; and deterrents such as CCTV and gating can all indicate to the would be intruder that your property is far from ideal for trespassing."

So what should you do if a fire breaks out? The first thing is to prepare for the worst. That includes getting workers out in case the fire gets worse. I used think that fire-drills at school were a great time to socialize but they are very important. Workers should have specific plans on where to go in case of a fire. Plant managers or owners should get with department heads and work out a plan to get everyone out safe. Everyone should know where the nearest exits are. Keep in mind that smoke during a fire can be blinding so you need to have drills where employees know how to crawl to exits if needed.

Second, to minimize the damage, proper fire extinguishers should be stationed throughout the building and people should be versed on proper use. Taking care of a small fire after it starts can save lives and downtime. Exits should be properly marked throughout the building.

Third, prevention caution should be taken so make sure flammable items are stored properly. Proper arc flash or fire retardant clothing is used and properly worn. Machinery should be properly installed.

Lastly, if a fire starts in your area attempt to extinguish, if this cannot be done, pull the fire alarm doors after everyone is out of that area to minimize the fire spreading. Always use stairs not elevators. Stay calm and do not panic. Help others that are having trouble but the most important thing is getting everyone out safe. •

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Manufacturers Profit with Full Capacity Injection Molders

Sourcing parts from domestic suppliers with in-house mold making capabilities and flexible services can provide major competitive advantages.

Manufacturers that use injection molders to produce components or assemblies are finding that they can gain significant competitive advantages when they do business with a domestic shop that offers a full spectrum of services under one roof. Among those potential advantages are: improved mold design, lower cost of ownership for that tooling, more consistent product quality, faster deliveries and more flexible volume requirements.

In addition, injection molders that provide part design assistance and prototyping can ensure a more efficient and often lower cost manufacturing process. It can also help eliminate the expense and downtime involved in making alterations to tooling due to design issues with the original mold.

Although not all shops offer flexible volume requirements, there are those that position themselves to provide volumes ranging from hundreds to many thousands of injection-molded parts on an economical basis, enabling manufacturers to test market or roll-out their products with lower initial investments.

In-House Tooling Capabilities

Injection molders that have in-house tool rooms and mold design specialists enable manufacturers to work with the same people from concept to completion, which makes tooling production more efficient and eliminates the "blame game" of having to deal with multiple vendors. It also enables the tooling specialists to develop the molds specifically for the products they will produce, and to ensure that molds will meet cost and lifespan requirements.

"Tooling is a sizable investment to begin with, so it is highly advantageous to work with an injection molding company who can assist with the initial design as well as handling the production and maintenance of molds on a long-term basis," says Jake Carse, founder of Fikkes Sporting Goods, Vancouver, Washington.

Fikkes is a manufacturer of carbon fiber products such as fishing rods, trekking poles, gun barrels and other tubular products. One of the company's most recognized products is the Fikkes Fly Hiker, a trekking pole with a Fikkes fly fishing rod stored inside.

"I believe it is particularly important to be able to get personal assistance on tooling from the injection molder at the design stage of our products," Carse says. "For instance, I approached our supplier, Rex Plastics, with an initial drawing that was done by hand. It was rather rough but conveyed the basic concept behind the product design. As a first step, the injection molder took that sketch and was able to turn it into a 3D AutoCAD file. From that point we went back and forth on various design factors, particularly the functionality of our product. When that was settled, which was fairly quickly, they were able to complete the design and production of the mold."

Carse adds that it is also important that the injection molder can manage any changes in tooling that may be necessary due to evolutions in the design of an OEM's product, and do so on an economical basis.

Rex Plastics, Inc. (Vancouver Washington), Fikkes injection molding vendor, is a supplier of thermoplastic and renewable biopolymer products. The company has a full-service in-house tooling department that provides customers with relatively inexpensive mold design and production, including modifications, all of which is aimed at providing quick turnaround and minimal downtimes.

Design Collaboration

Greg Nuber, Sales Manager at Big Blok LLC, says that supplier collaboration with the injection molder on tooling design was an essential requirement for his company.

Big Blok manufactures containers from high quality LDPE (Low Density Polyethylene) designed for supplying items such as water, fuel and grain during emergency relief efforts. The lid for these interlocking containers, which range in size from 10 gallons up to 37 gallons, is made of thermoplastic and provided by Rex Plastics.

"Because our Big Blok containers are used for emergency relief, we anticipate that the loading and shipping and then unloading and dispensing of supplies put into the containers will all be done under adverse conditions," Nuber explains. "Therefore, the design and construction of the container lid is of vital importance. And that was a major criterion in determining our selection of our injection molder. When we created our current lid, we had to create a new mold. It was very complex, so the injection molder took charge of the design work and told us what we should look for, and then reviewed the detailed drawings with us. It was a very comprehensive process."

As an example of its standard design collaboration, Rex Plastics provides a free design evaluation, and then recommends either "design for manufacturing" expertise (at no cost to fine-tune your product), or will quote a more extensive re-design if that is required to get your product ready for manufacturing.

Secondary Services

Another important in-house capability that some domestic injection molders offer is-secondary services. These can range from color printing, 3D printing, ultrasonic welding and drilling & tapping of molded parts to a variety of assembly procedures. In the case of Fikkes, Jake Carse says that his injection molder provided the secondary service of installing a metal insert into the first run of the Fly Hiker Trekking Pole.

"That was probably done for the first several hundred items," Carse explains. "After that we started to do that job in-house. But having our molding supplier handle that at the beginning helped us get our first products out the door more efficiently."

Flexible Volume Requirements

As an adjunct to in-house design and production capabilities, many OEMs – particularly smaller and mid-size manufacturers – find it highly advantageous to deal with injection molders that offer flexibility in pricing and services.

Smaller companies, and start-ups in particular, may not be experienced enough to fully anticipate the complexities of tooling design and the volume and cost commitments that are involved in doing business with many injection molders. However, some shops offer greater latitude on those tooling and injection molding volume requirements, plus some other allowances that can be very helpful to smaller manufacturers.

Rex Plastics, for example, provides a lifetime guarantee of the molds they produce as well as a rebate on the cost of design and prototypes for customers who utilize its tooling and injection molding processes. This supplier also has flexible volume requirements with no minimums.

"If your supplier is flexible on the costs of tooling and volume requirements, you have a much greater opportunity to test your ideas," says Carse. That is because you're not sitting on so much inventory and so much of an investment that you can't afford to try to modify and improve your product. Because of the flexibility we get from our supplier, we can modify our product design and do another run. We do these things in order to make our products more successful."

Carse says it is very difficult to get this type of flexibility from overseas vendors. He feels that high volume requirements, protracted turnaround times, and design limitations due to communication challenges can devastate the profit incentives for sourcing overseas.

"I believe it's pretty tough to do business overseas without losing money – at least initially," he explains. "It may be appealing when you first look at it, probably because it appears to be cheaper. But in my experience in getting work such as injection molding done overseas it has not really been less expensive; it has been at least the same cost . . . plus more headaches and longer turnaround times."

Conversely, if the injection molder offers lower, more flexible pricing for tooling along with lower volume requirements – perhaps beginning with production of as few as 100 items –- small businesses and even inventors can afford to develop or test market their products without making an overwhelming investment, Carse advises.

For more information, contact Rex Plastics, Inc., 12515 NE 95th Street, Vancouver, WA 98682; Phone: (800) 839-0366, (360) 892-0366; Fax: (360) 892-1507; E-mail: service@rexplastics.com, or visit the web site: www.rexplastics.com •

Proximity: The New Business Model for Repair Services

Fortune 500 manufacturers look to speed repairs while reducing costs by working with international repair services that offer full service locations in close proximity

Given the increasing cost of ongoing maintenance and repair at any industrial plant, many manufacturers are discovering the value and advantages of working with a repair service company that not only has the size and expertise, but also is as nearby as possible.

Proximity, after all, has many advantages for the manufacturer. First and foremost, having a repair service in close proximity means repairs can be completed faster and the maximum possible uptime maintained. Today, most manufacturing plants, need replacement parts quickly.

Proximity also means faster service and reductions in shipping costs.

For plant maintenance departments, the savings achieved by being close to a reputable repair service company impacts the balance sheet by extending the life of plant assets and keeping them in production.

Considering the vast range of parts that need servicing in any given plant - such as drives, PLC's, servo motors, CNC machines, spindles, ballscrews, hydraulic components, robotics, material handling components, valves, safety curtains, pumps, actuators, and torque tools - the cost savings can amount to millions.

Take the case of the automobile manufacturing industry, currently enjoying a renaissance. *No summer vacation for swamped Fiat Chrysler*, read the headline of a May 15, 2015 article in the *USA Today* supplement. The story listed a major US auto engine manufacturer in Michigan as one of the impacted plants.

The plant, like so many similar large manufacturing plants, requires constant maintenance of its motors, spindles, actuators, etc. To keep up with the demand, the plant uses nearby K+S Services for its repair services on an almost daily basis. The fact that only ten miles separates the two, accounts for much of this successful relationship.

Headquartered in Southgate, Michigan, K+S Services, Inc. is unique in the repair service business as it pursued a strategic

For plant maintenance and repair departments, the savings achieved by being close to a reputable repair service impacts the balance sheet by extending the life of plant assets and keeping them in production.

model of expansion by opening new locations in close proximity to existing major plants, as well as geographic regions that attract and support U.S.-based manufacturing.

The company now operates eleven facilities across the globe, including the U.S., Mexico, Canada, and Europe. More than just a store front with a lone representative that coordinates with a larger office, these repair facilities are fully functioning shops with managers, technicians and spare parts at every location.

This business model not only delivers all the benefits of high quality repair services, but provides these services in close proximity to where they are needed.

Building on a strong relationship and performance, K+S was recently awarded UTC Supplier Gold status by demonstrating "best in class" quality and delivery performance, implementation of a lean culture, and overall strong customer satisfaction. Achieving Competitive Excellence, or ACE, is the UTC operating system for promoting quality, delivery, efficiency and customer satisfaction. UTC Supplier Gold is a program that facilitates and accelerates supplier performance improvements which recognizes suppliers who have achieved exceptional performance.

In the case of the engine manufacturer, for example, K+S Services maintains a spindle-repair facility within five miles that handles emergency needs. From a logistics standpoint alone, turnaround time is practically negligible. Cases exist where a part has been picked up in the morning, fixed, and returned that same afternoon.

If physical proximity in terms of location has its benefits, there is no relationship closer than having a repair service representative stationed within the plant itself.

In K+S' Smart Total Asset Management Program (STAMP), customers are assigned a full-time, on-site account manager to serve as a one-stop facilitator and manager of all repairable assets within a specific plant.

This includes tracking all repairs, expediting when required, shipping or delivering to and from the nearby repair facility, maintaining database integrity, streamlining and stabilizing procedures, generating a wide variety of reports and keeping the customer informed throughout the process. The facilitator works with the plant to establish min and max levels to ensure effective lead-time fulfillment of repairs and uptime.

When the part arrives at the repair facility, technicians conduct an evaluation to identify the probable cause of failure, and then repair and test the part per the manufacturing test procedures. After being repaired the item is tested with the associated closed loop test system for the specified duration. The part and its associated documentation are then sent back to the plant.

Proof of the success of this business model rests with the number of corporations ascribing to it. Major companies such as Continental, GM, Fire Stone, Ford, Goodyear, GE Air, Chrysler, and UTC are current STAMP customers. K+S successfully services well over 800 manufacturers.

This success points to a very good reason why the local repair-service model should see even greater adoption by more manufacturers in the immediate future.

For more information, contact K+S Services, Inc. Headquarters; 15677 Noecker Way; Southgate, MI 48195; (734) 1-374-0400 or 800-542-1331; sales@k-and-s.com; or www.k-and-s.global •

Considering the vast range of parts that need servicing in any given plant, such as servo motors, the cost savings of having a close repair service can amount to millions.

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RISK MANAGEMENT

RISK Management from Fire to Super Storms: Managing Supply Chain Disruptions

By: David Simchi,- Levi, William Schmidt, Yehua Wei

Traditional methods for managing supply chain risk rely on knowing the likelihood of occurrence and the magnitude of impact for every potential event that could materially disrupt a firm's operations. For common supply-chain disruptions—poor supplier performance, forecast errors, transportation breakdowns, and so on—those methods work very well, using historical data to quantify the level of risk.

But it's a different story for low-probability, high-impact events—mega disasters like Hurricane Katrina in 2005, viral epidemics like the 2003 SARS outbreak, or major outages due to unforeseen events such as factory fires and political upheavals. Because historical data on these rare events are limited or nonexistent, their risk is hard to quantify using traditional models. As a result, many companies do not adequately prepare for them. That can have calamitous consequences when catastrophes do strike and can force even operationally savvy companies to scramble after the fact—think of Toyota following the 2011 Fukushima earthquake and tsunami.

To address this challenge, we developed a model—a mathematical description of the supply chain that can be computerized—that focuses on the impact of potential failures at points along the supply chain (such as the shuttering of a supplier's factory or a flood at a distribution center), rather than the cause of the disruption. This type of analysis obviates the need to determine the probability that any specific risk will occur—a valid approach since the mitigation strategies for a disruption are equally effective regardless of what caused it. Using the model, companies can quantify what the financial and operational impact would be if a critical supplier's facility were out of commission for, say, two weeks—whatever the reason. The computerized model can be updated easily and quickly, which is crucial since supply chains are in a continual state of flux.

In developing and applying our model at Ford Motor Company and other firms, we were surprised to find little correlation between how much a firm spends annually on procurement at a particular site and the impact that the site's disruption would have on company performance. Indeed, as the Ford case study described later in this article shows, the greatest exposures often lie in unlikely places.

In practice, that means that leaders using traditional risk-management techniques and simple heuristics (dollar amount spent at a site, for instance) often end up focusing exclusively on the so-called strategic suppliers for whom expenditures are very high and whose parts are deemed crucial to product differentiation, and overlooking the risks associated with low-cost, commodity suppliers. As a result, managers take the wrong actions, waste resources, and leave the organization exposed to hidden risk. In this article, we describe our model and how companies can use it to identify, manage, and reduce their exposure to supply chain risks.

Time to Recovery and the Risk Exposure Index

A central feature of our model is time to recovery (TTR): the time

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it would take for a particular node (such as a supplier facility, a distribution center, or a transportation hub) to be restored to full functionality after a disruption. TTR values are determined by examining historical experience and surveying the firm's buyers or suppliers (see the sidebar "Assessing Impact? Use a Simple Questionnaire"). These values can be unique for every node or can differ across a subset of the nodes.

The first step in assessing the risk associated with a particular supplier is to calculate time to recovery (TTR) for each of its sites under various disruption scenarios. Companies can develop a simple survey to collect key data, including:

1. Supplier

- Site location (city, region, country)

2. Parts from this site

- Part number and description
- Part cost
- Annual volume for this part
- Inventory information (days of supply) for this part
- Total spend (per year) from this site

3. End product

- OEM's end product(s) that uses this part
- Profit margin for the end product(s)

4. Lead times from supplier site to OEM sites

- Days

5. Time to recovery (TTR)

The time it would take for the site to be restored to full functionality

- if the supplier site is down, but the tooling is not damaged
- if the tooling is lost

6. Cost of loss

- Is expediting components from other locations possible? If so, what is the cost?
- Can additional resources (overtime, more shifts, alternate capacity) be organized to satisfy demand? If so, what is the cost?

7. Supplier risk assessment

- Does the supplier produce only from a single source?
- Could alternate vendors supply the part?
- Is the supplier financially stable?
- Is there variability in performance (lead time, fill rate, quality)?

8. Mitigation strategies for this supplier-part combination

- Alternate suppliers
- Excess inventory
- Other

Our model integrates TTR data with information on multiple tiers of supplier relationships, bill-of-material information, operational and financial measures, in-transit and on-site inventory levels, and demand forecasts for each product. Firms can represent their entire supply network at any level of detail—from individual parts to aggregations based on part category, supplier, geography, or product line. This allows managers to drill down into greater detail as needed and identify previously unrecognized dependencies. The model can account for disruptions of varying severity by running scenarios using TTRs of different durations.

To conduct the analysis, the model removes one node at a time from the supply network for the duration of the TTR. It then determines the supply chain response that would minimize the performance impact of the disruption at that node—for instance, drawing down inventory, shifting production, expediting transportation, or reallocating resources. On the basis of the optimal response, it generates a financial or operational performance impact (PI) for the node. A company can choose different measures of PI: lost units of production, revenue, or profit margin, for instance. The model analyzes all nodes in the network, assigning a PI to each. The node with the largest PI (in lost sales, for instance, or lost units of production) is assigned a risk exposure index (REI) score of 1.0. All other nodes' REI scores are indexed relative to this value (a node whose disruption would cause the least impact receives a value close to zero). The indexed scores allow the firm to identify at a glance the nodes that should get the most attention from risk managers.

At its core, the model uses a common mathematical technique—linear optimization—to determine the best response to a node's being disrupted for the duration of its TTR. The model accounts for existing and alternative sources of supply, transportation, inventory of finished goods, work in progress and raw material, and production dependencies within the supply chain.

Our approach provides a number of benefits. It:

Identifies hidden exposures.

The model helps managers identify which nodes in the network create the greatest risk exposure—often highlighting previously

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hidden or overlooked areas of high risk. It also allows the firm to compare the costs and benefits of various alternatives for mitigating impact.

Avoids the need for predictions about rare events.

The model determines the optimal response to any disruption that might occur within the supply network, regardless of the cause. Rather than trying to quantify the likelihood that a low-probability, high-risk event will strike, firms can focus on identifying the most important exposures and putting in place risk-management strategies to mitigate them.

Reveals supply chain dependencies and bottlenecks.

Companies can also use the analyses to make inventory and sourcing decisions that increase the robustness of the network. This includes taking into account the likely scramble among rival companies to lock in alternative sources if a supplier's disruption affects several firms. Such cross-firm effects of a crisis are often overlooked. Contracts with backup suppliers can be negotiated to give a company priority over others should a disruption with the primary supplier occur, which would decrease time to recovery and financial impact.

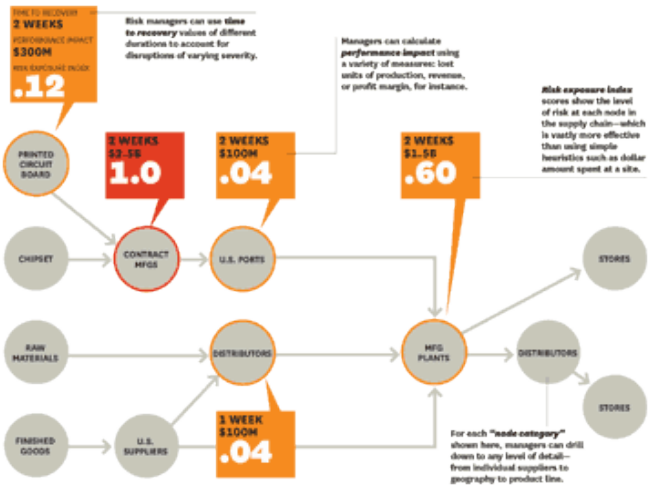
Promotes discussion and learning.

In the course of analyzing the supply chain in this way, managers engage in discussions with suppliers and internal groups about acceptable levels of TTR for critical facilities and share insights about best-practice processes to reduce recovery time. As a result, the impact of disruptions is minimized.

Prescriptive Actions

Our model provides organizations with a quantitative metric for segmenting suppliers by risk level. Using data generated by the model, we can categorize suppliers along two dimensions: the total amount of money that the company spends at each supplier site in a given year, and the performance impact on the firm associated with a disruption of each supplier node. Let's now take a look at the supplier segments and consider the risk-management strategies appropriate for each.

Our model allows companies in any industry to effectively identify areas of hidden risk in the supply chain. Imagine a high-tech manufacturer that has suppliers and assembly plants all over the world. For each node in the supply chain, managers estimate the time to recovery if a disruption occurred at that node (how long it would take for the node to be restored to full operation) and then calculate the performance impact (lost sales during TTR, for instance). By indexing the performance impact values, managers can see at a glance which nodes represent the highest risks and direct their mitigation strategies accordingly.



Obvious high risk.

Most companies focus their risk-management activities on suppliers for whom total spend and performance impact are both high. Typically, these are the suppliers of expensive components, such as car seats and instrument panels, that strongly affect customers' purchase decisions and experience. The cost of these "strategic components," as they're frequently called, often make up a large portion of the total manufacturing cost. Indeed, for many companies, they represent 20% of the suppliers but account for about 80% of a firm's total procurement expenditures. Because strategic components typically come from a single supplier, appropriate risk-mitigation strategies include strategic partnering with the suppliers to analyze and reduce their risk exposure, providing incentives to some suppliers to have multiple manufacturing sites in different regions, tracking suppliers' performance, and developing and implementing business continuity plans.

Low risk.

Suppliers with low total spend and low financial impact do not require intense risk-management investment. In our experience, most companies effectively manage the minimal risks from disruptions of these supplier sites by investing in excess inventory or negotiating long-term contracts with a penalty clause for nonperformance.

Hidden risk.

Many companies, however, are subject to considerable exposure from "hidden risk" suppliers. Here, total spend is low but the financial impact of a disruption is high. Even the savviest managers are prone to equating total spend with performance impact: They rightly identify strategic components as carrying high levels of supply chain risk, but fail to consider that low-spend suppliers, often of commodity goods, may represent outsize risks. Traditional risk-assessment exercises overlook these components because they are perceived as adding little value to the firm's products. But the reality is that markets for commodity goods are typically dominated by only a few manufacturers, leaving purchasers susceptible to

disruptions. For example, in the automotive industry, a carmaker's total spend on suppliers of O-rings or valves is typically quite low, but if the supply is disrupted, the carmaker will have to shut down the production line. Thus, it is critical to ensure that an adequate supply is available. That can often be accomplished using the strategies that apply to the other segments: investing in excess inventory, requiring suppliers to operate multiple production sites, or implementing dual-sourcing strategies.

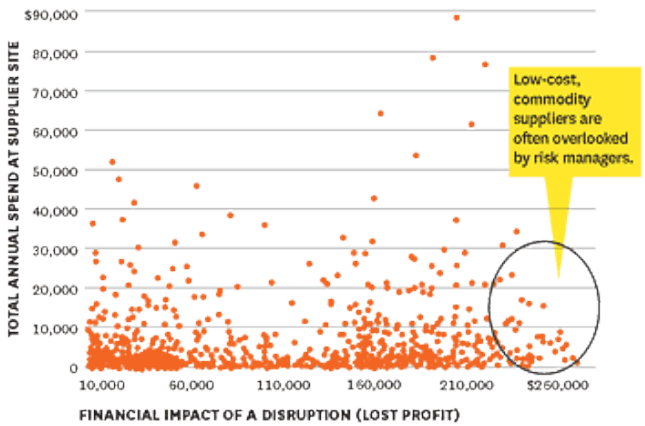
Alternatively, companies can use flexibility to deal with hidden supply risks. For example, system flexibility (the ability to quickly change the production mix of plants) allowed Pepsi Bottling Group to rapidly respond to a supply disruption caused by a fire at a chemical plant near one of its suppliers. Similarly, product-design flexibility (in this case, the use of standardized components) enabled Nokia to recover quickly from a disruption of its supply of radio frequency chips caused by a fire at a supplier's factory. Finally, process flexibility (achieved in this case by adjusting workforce skills and processes) allowed Toyota to quickly restore the supply of brake-fluid-proportioning valves (P-valves) after a major disruption.

Case Study: Ford Motor Company

We used our methodology to analyze Ford's exposure to supply chain disruptions. Working together with Keith W. Combs, Steve J. Faraci, Oleg Y. Gusikhin, and Don X. Zhang, managers in Ford's purchasing and R&D groups, we looked at two scenarios: In the first, the supplier's production facility is disrupted for two weeks. In the second, the supplier's tooling must be replaced, halting operations at its facility for eight weeks. (Details have been altered to mask sensitive Ford data.)

Ford has a multitier supplier network with long lead times from some suppliers, a complex bill-of-materials structure, buffer inventory, and components that are shared across multiple product lines. Approximately 61% of the supplier sites would have no impact on Ford's profits if they were disrupted. By contrast, about 2% of the supplier sites would, if disrupted, have a significant impact on Ford's profits. The supplier sites whose disruption would cause the greatest damage are those from which Ford's annual purchases are relatively small—a finding that surprised Ford managers. Indeed, many of those suppliers had not previously been identified by the company's risk managers as high-exposure suppliers. (See the exhibit "Impact of Supplier Disruptions on Ford's Profits" for an analysis of 1,000 Ford supplier sites.)

The sites whose disruption would cause the greatest damage are those from which Ford's annual purchases are relatively small. Ford had not previously identified many of them as high-exposure suppliers. (Data have been disguised to protect sensitive competitive information.)



Using the model, Ford was able to identify the supplier sites that required no special risk-management attention (those with short TTR and low financial impact) and those that warranted more-thorough disruption-mitigation plans. The results from the analysis allowed Ford to evaluate alternative steps it might take to defuse high-impact risks and to better prioritize its risk mitigation strategies. For example, managers learned that the risk-exposure-index scores associated with certain suppliers are highly sensitive to the amount of inventory the firm carries. For that reason, Ford put processes in place to monitor the inventory related to those suppliers on a daily basis.

In March 2012, the auto industry was rocked by a shortage of a specialty resin called nylon 12, used in the manufacture of fuel tanks, brake components, and seat fabrics. The key supplier, Evonik, had experienced a devastating explosion in its plant in Marl, Germany. It took Evonik six months to restart production, during which time the downstream production facilities of Ford and other major automakers were severely disrupted. Had Ford managers used our framework prior to this disruption, they would have detected the risk exposure and associated production bottleneck and proactively worked with Evonik to fast-track its plans to bring online a new plant in Singapore, currently slated to begin production in 2015.

Ford's supply chain, like those of many other companies, has become increasingly globalized, complex, and extended. This has had the effect of introducing more potential points of failure that Ford must recognize and manage. Using our model, it can rapidly quantify its supply chain exposure and identify effective strategies to mitigate the impact should disruptions occur.Our approach to managing supply chain risks allows managers to avoid guessing the likelihood of infrequent, high-impact events and instead concentrate on evaluating their organization's vulnerability to disruptions, regardless of their cause and where they strike. The method is quantitative, produces a risk exposure measure that is easy to understand, and supports a supplier segmentation process that results in supply networks that are much more resilient. •

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