



## ABSTRACT

Safety of the transformers is of great importance for the reliable electrical power supply and business operation. Some transformers, like transformers with mineral oil, are at higher risk. Mitigation of the risks of the transformer asset is a very important topic that requires physical, engineering knowledge, the use of advanced monitoring and condition assessment technologies. The right decisions can increase the safety of the transformers but also ensure workers' safety as well as the reliable continuation of the business.

## KEYWORDS

decision-making, mitigation, risk management, risks

# Transformer safety is paramount, but are we acting on it?

From the inconvenient to the catastrophic, a transformer failure can mean anything from a slight glitch to months of business disruption. And those businesses that depend on transformers insulated by mineral oil are particularly at risk. With a high calorific value, mineral oil transformer fires burn intensely. They are notoriously difficult to control – posing significant health and safety risks. This is before the consequences of transformer failure are felt by



## Transformers insulated by mineral oil are particularly at risk since mineral oil fires burn intensely and are notoriously difficult to control

diligent in making recommendations to that end, many of those recommendations are not being implemented.

### Recommending risk mitigation

It is clear from the results that engineers are making a good spread of recommendations to mitigate the transformer-related risk. Switching to condition-based monitoring stood out as an emerging preference with nearly half of survey respondents (49 %) stating they had proposed it. Maintenance regime changes, asset replacement, asset repair and reconditioning, and substation upgrades were also prevalent. However, many of these recommendations are not being implemented fully, only 44 % are, to be precise, with a further 41 % of businesses choosing to take only some of the recommendations forward.

A combination of factors stands in the way of senior managers pursuing all relevant avenues to mitigate the transformer-related risk. Indeed, CAPEX was cited as the most significant barrier (56 %). However, more pressing commercial (38 %) and engineering (36 %) priorities were also cited frequently.

### Confident decision making?

When considering the significant implications of leaving transformer risk unmitigated, it is important that engineers' concerns are heard, and their recommendations considered, if not fully implemented. However, our research revealed that this may not always be the case.

Of those we spoke to, just over half (56 %)

said they felt confident in their senior management team's awareness of the risks and their ability to plan accordingly. That leaves just under half of the engineers who were not confident or did not feel like they had enough insight to say either way.

Could one reason for the lack of action be that senior management does not fully understand the seriousness of mitigating the transformer-related risk? It is quite possible. The links between failure and risk are intricate. From CAPEX, OPEX, and safety, to insurance, environmental impacts, and asset integrity, it is understandable if not everyone on the board is up to speed. But transformer failure can impact business continuity for months, so it is not something boards will want to leave unmitigated.

### Improving the substation to boardroom connection

If the nuances of risk mitigation are getting "lost in translation," engineers may need to round out the case more fully to catch the ear of the decision makers – what seems obvious to an engineer may not be to others. Here is how you can smooth out the path:

- Tip 1: Put transformers on the board-sponsored risk register. Many businesses will already have some form of the risk register in place to identify, assess, and manage risk but our survey revealed only 14 % thought it was being used by senior managers to mitigate risk. Having transformers included on this register provides them with more visibility at a c-suite level as well as for the associated regulatory compliance.

the operator or owner in terms of downtime, business continuity, loss of revenue, and site damage – all of which can extend into millions of dollars in expenses. With all that said, the importance of businesses having the ability to accurately assess and mitigate transformer risk cannot be overstated.

Rightly, senior managers are concerned about business continuity and the safety of the operations that underpin it. But are these business priorities being translated into action on the ground? Our research - [The MIDEL Transformer Risk Report 2020](#) - highlights a gap.

Conducted to enhance the understanding of transformer-related risk, our research analysed the key concerns and risk-mitigation trends as well as garnering opinion on board awareness and priorities. It revealed that, while lowering the risk is given universal priority and engineers are

## Engineers are making a good spread of recommendations to mitigate the transformer-related risk

## Sometimes the lack of safety actions is caused by decision makers' lack of understanding of the seriousness of the transformer-related risks

- Tip 2: Now you have got more visibility, but there may still be some people in the room that do not fully appreciate transformer risk and why it should be addressed urgently. Have someone present the problem and contextualise the issue - the underlying decision is not about a transformer but rather about the workers' safety, the company's bottom line, and the impact of the operations on the environment. These factors are all boardroom-level discussions.
- Tip 3: Invite an open discussion to ensure everyone understands the potential risks regarding this and other projects that may be competing for finite resources. It is important that engineers feel like they have been listened to and can leave the room feeling confident in their senior management team's understanding of the risks and the options available. Equally, they will feel even more confident if the reasons for any decisions to deny or delay the

recommendations are discussed with them.

Strengthening the connection between the substation and the boardroom gives the industry a focus on improvement. Businesses need to ask themselves what actions need to be taken to boost confidence in making these decisions. Whether the issue is with communication, education, or both, each scenario will require a tailored approach.

### Considering new options

On a more practical note, the way assets in all industries are monitored and maintained is changing, encapsulated by a growing trend to consider asset management and safety more holistically. Transformers are no different. At the same time, engineers are increasingly faced with ageing fleets that are not only time-consuming to maintain but can also increase risk. While condition-based monitoring stands to alleviate many of these concerns, physical improvements, such as retrofilling, will continue to be important, particularly for mitigating risk at scale.

When we spoke to the industry colleagues about what transformer risk mitigation strategies their companies use, a noticeable swing was already in effect. While time-based maintenance is still a common approach (58 % of the respondents reported they used it), industry professionals predict this will change in the near future as engineers seek to maintain assets in the most cost-effective way.

This reflects a growing trend towards more holistic asset management approaches, partly enabled by the unprecedented levels of insight afforded by digitalisation. As the infrastructure digitalises, assets can report their condition in real-time, meaning the engineers are no longer required on site in order to

## Strengthening the connection between the substation and the boardroom gives the industry a focus on improvement





effectively manage asset risk. As such, the use of condition-based monitoring seems set to increase rapidly.

### Physical mitigation techniques

However, not all risk can be mitigated by digital techniques. Indeed, condition-based monitoring is often more like a doctor that diagnoses the problem rather than prescribing the cure. In those cases, the answer may lie in physical solutions.

Retrofilling of transformers from mineral oil to fire-safe readily biodegradable ester fluids is expected to be increased in use. Not only is it a proven and cost-effective technique for reducing fire risk, but it can also elongate the lifespan of the transformer and improve resilience to the implications of overloading. In fact, our results suggest that its use as a risk mitigation technique is set to increase.

Ultimately, the safety goal for any company is to operate with as little risk as possible, and the impact of failure on business continuity and reputation will always far outweigh the cost of mitigating transformer risk. That being so, it is in every senior management team's interest to work with their engineers to get to grips with transformer-related risk. Together, busi-

## Retrofilling of transformers from mineral oil to fire-safe readily biodegradable ester fluids is expected to be increased in use

nesses could substantially reduce the risk of failure, fatality, or fire posed by transformers by taking just a few well-considered measures.

### About the report

The survey, which attracted responses from transmission and distribution operators, original equipment manufacturers, and commercial and industrial operators across EMEA, the Americas,

and APAC, aims to enhance board-level understanding of transformer-related risk. The report assesses the key concerns and risk mitigation trends as well as garnering opinion on board awareness and priorities.

### Bibliography

[1] The MIDEL Transformer Risk Report 2020, <https://www.midel.com/trr2020/>, current 5 Aug 2020

### Author



**Barry Menzies** studied Chemical Engineering at the University of Bradford in the UK while being sponsored by BP International, and an MBA at Herriot Watt University in Edinburgh. Most of his career has been in chemical manufacturing including engineering, manufacturing, and commercial roles in Unilever, ICI, and INEOS in both Europe and Asia-Pacific. Barry joined M&I Materials in 2011 as Commercial Director.