Protecting assets with Siemens Pretact®

Use case: bullet resistant power transformers

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The challenge

Transformers serve as critical nodes designed to withstand many operational risks, such as severe weather events and network power fluctuations. Until now, however, there remained one risk to the assets: human impacts.

One of our U.S. customers decided to address this risk with an innovative concept that does not require further investment to build a concrete wall around the premises.

For the customer, versatility and protection were crucial factors. This is where the Pretact® concept of Siemens Transformers came in handy. It enables a modular combination of approved technologies and latest innovation.

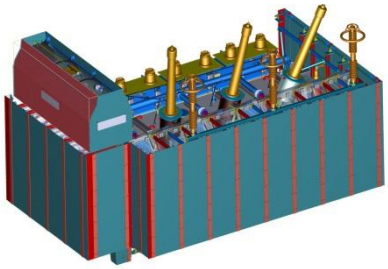
The customer requested a generator step-up transformer with 970 MVA at 345kV +2x2.5% - 24.8/21.1/17.3kV with a link board to reconnect the low-voltage side. The three-phase unit also allows for voltage regulation on the high-voltage side as it needs to fit five different generating stations and nine different locations, and most importantly, must be protected against high-powered ballistics.

The solution

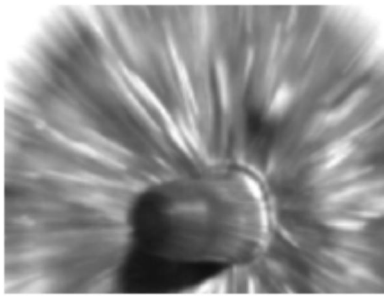
Siemens offered its one-of-a-kind bullet resistant shielding to safeguard the versatile generator step-up transformer. This product ensures the highest safety and reliability by incorporating bullet-resistant panels that are mounted directly on the transformer tank. It not only protects the tank and radiator cooling system against bullets, it also shields the conservator, turrets, and the bottom of the bushings.

Mounting the system directly on the transformer also minimizes the amount of additional space required for the transformer. The panels can also be adapted to reduce acoustic emissions, and their positioning allows for both maintenance and the movement of air for efficient cooling.

In this special case, only three sides are covered with bullet resistant panels, because the low-voltage side of the transformer is built right next to the generator building. To enable access to pumps and fans for maintenance, some of the panels are designed to be removeable.



Example of a bullet-resistant tank design with protected radiators and conservator



A VPAM Class 13, .50 BMG M2 AP round – representing the highest likely ballistics threat – being reflected by the Siemens protection system.

Mitigate risks and protect assets without compromising performance and reliability.

From fundamental research to customer-oriented solutions
Mounting panels on transformers is not a new invention: this method has been used to reduce transformer noise for many years. However, our engineers know there is always room for improvement, and so they developed additional features that can be incorporated into this equipment.

Over the course of several studies, we found that a 10 mm steel sheet can be easily penetrated by a VPAM Class 7 bullet, and even concrete is not an adequate material for preventing our units from harm. We finally came up with a material that even deflects VPAM Class 13 (.50 BMG M2 AP) bullets – the highest class of rifle projectile.

As part of Siemens Transformers' resilience concept Pretact®, the bullet resistant tank feature, can be combined with other resilience modules and can also be used for retrofitting and new installations.

Technical Features
The transformer itself is designed as a versatile unit that may be operated in nine different power-generating locations, which the customer defines before the engineering phase.

To save space and construction costs, the panels are mounted directly on the transformer tank wall using steel brackets. The shielding can be easily installed without additional construction investment, such as walls or a larger foundation.

While in this case the customer decided to protect a newly manufactured unit with our bullet resistant panels, it is also possible to retrofit transformers and reactors already in operation.

With a retrofit we can also replace porcelain bushings with polymer or composite resin-impregnated types, so even if a bushing's insulation is penetrated, it is unlikely to lead to ignition of the oil.

Protecting assets – one of three modules within Pretact® - React in advance

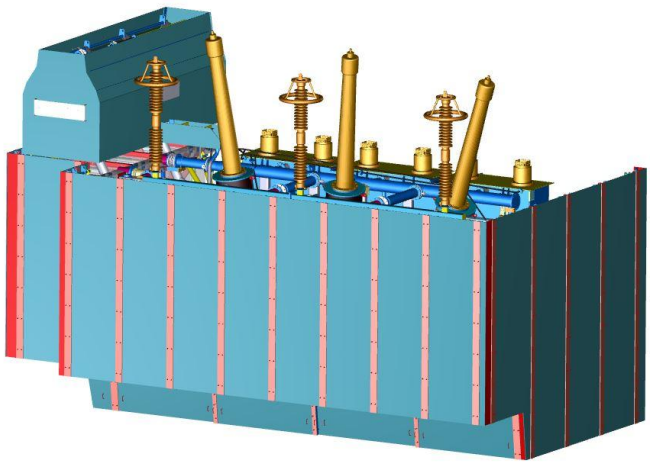
Protecting assets from harm is one module in the Siemens Transformers concept for enhanced grid resilience.

PREVENT
Includes measures that prevent operational failures, like condition monitoring and other transformer lifecycle services

PROTECT
Includes measures to protect assets from harm from the outside, like GIC-safe solutions, DC compensation, alternative fluids, tank rupture etc.

REACT
Includes products that enable transformer operators to react rapidly to an emergency with flexible, mobile replacement units with plug-and-play bushings for fast installation.

If you would like to be proactive and want to find out more about Pretact®, contact us!



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