Safety services
Personnel risk prevention
There are rare cases where failure inside a medium-voltage switchgear cabinet, due to a defect, exceptional service condition or incorrect operation can cause an internal arc – a short circuit current flowing through the air. This can create a significant hazard due to the instantaneous increase in temperatures at the fault location to around 20,000°C, well above the melting point of steel, copper and insulation materials. Internal components are vaporized and the sudden release of heat and plasma (ionized gas) creates an explosive blast.

Maximum protection of all personnel during an arc-fault is of course the number one priority. Approximately 75% of the internal arcs occur with an operator working at or standing in front of the switchgear. On IAC (internal arc classified) switchgear, personal protection is fully accomplished by an integrated pressure relief system. Regarding non-IAC switchgear, this passive protection is not given in full respect since heat and plasma can escape. This significantly reduces personal safety on site, especially in cases where proper passive protection has not been integrated in the past. In those cases, all of the heat and plasma normally escapes at the weakest point of the switchgear which in many cases happens to be the door.

Passive protection can increase personal safety, but it is advisable to take active measures to prevent such an event from happening in the first place. This not only eliminates risk to people, but also offers protection against damage and even destruction of system components. The consequential production outage of the plant often results in higher costs than the calculated project costs of the damaged switchgear. Employee safety and reliable personnel risk prevention are the highest aims for ABB.

For this reason, ABB provides a wide range of offerings to help its customers to address all safety elements.
Knowing and improving the condition of the equipment is a key factor in reducing the likelihood of failure, damage, and injury.

To improve the condition of a switchgear ABB has various options available:
- Asset risk assessments to establish the risk profile of equipment based on its condition and importance in the system, and prioritize actions to mitigate the risk before the hazard occurs
- Risk monitoring and mitigation programs to maximize improved reliability and reduced operator exposure
- Equipment upgrades and retrofit which decrease operator exposure because of reduced maintenance, faster cycle times, and lower clearing times
- Diagnostic testing to address concerns of bad connections, pollution, mechanical faults and minimize failures due to defective devices

ABB asset condition and risk assessment evaluates high risk assets and develops mitigation strategy
Maintaining a safe distance between personnel and equipment during critical operations provides the most effective means of avoiding injury by keeping people out of harm’s way:

− Remote racking provides a safer operating environment for personnel through the proven method of adding distance between the operator and arc flash incident energy at the switchgear site, bringing operation of power circuit breakers to a new level of safety.

− The installation of voltage indicators on accessible power circuits can increase the operators safety and avoid accidental electrical contact injuries. VisiVolt is an ABB passive voltage indicator perfectly suiting the equipment upgrade. It is adapted for permanent installation on busbar and naked or insulated metal conductors, indicates the presence of voltage by displaying a large and well visible lightning arrow sign on its display. The relevant silicone elastomeric enclosure ensures performance also in outdoor conditions while its fluorescent orange color provides good visibility among the other elements of the system.

− Infrared (IR) thermal measurements are performed through dedicated arc-proof ports with power compartment doors closed. The periodic thermo-graphic inspection of the critical areas (e.g. power cables connections) is an efficient method for preventing associated faults. Ports can be added to existing switchgear by ABB expert engineers keeping the original equipment design characteristics.

− Periodic measurement of the partial discharge (PD) level is a proven method for detecting insulation degradation before real insulation failure develops. The assessment results are documented as trend curves for each switchgear compartment, where the curves with high increase of partial discharge activity level indicate compartments with high risk of insulation failure. Site work is performed with closed doors.

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ABB vacuum circuit breakers can be provided with a fully integrated motor operated racking system for their use in new replacement switchgear or as part of the hard-bus and cradle-in cradle retrofit solutions.
Reduction of time for clearing fault conditions has a dramatic impact on the energy released and consequent damage and injury.

Time reduction for clearing faults has a huge impact on consequent damages and injuries limitation. Three main areas can be effectively addressed:

- **MV equipment faults**: relay upgrades with Relion microprocessor equipment which operate faster than electromechanical relays and support faster clearing times.
- **Short-circuit current**: Is-limiter device as a fast operating interrupting device that limits the short circuit current to a level that breakers and buses can withstand, protecting property and personnel. Replacement of existing switchgear and cable connections with new equipment with higher short-circuit ratings can be technically impossible. The use of Is-limiters reduces the short-circuit current in extensions of existing systems and in new systems. The Is-limiter is capable of detecting and limiting a short-circuit current during the first current rise in less than a millisecond.
- **Arc-faults**: REA arc flash mitigation relay uses patented fiber-optic sensor technology that instantaneously detects light from an arc to signal a “trip” to the designated circuit breaker in less than 2.5 ms, minimizing an arc flash incident.
- **Arc-faults**: UFES, an ultra fast earthing switch, provides detection and grounding of faults in times significantly faster than breaker clearing times, leading to the avoidance of injury and damage and the reduction of production outages. A device as small as an insulator offers enhanced protection for your switchgear by the effects of internal arcs. The UFES arc protection system channels the uncontrolled release of energy by the arc into a solid metal, 3-phase connection to earth potential. The internal arc will be extinguished within an operation time of < 4ms after detection of the fault.
Adequately trained personnel are essential to safe operations

Training, Procedure Development, Engineering Studies:
– Training engineering and technical services provide personnel with a better understanding of their equipment and systems and the safest means to operate them
– Arc flash studies help to determine the necessary level of protective equipment or clothing (PPE) to be worn by workers in close proximity to potential arcs and also help determine the proper application of any arc flash mitigation equipment to be installed
– Engineering studies determine the proper settings and system coordination, while addressing the speed of the system to handle a fault so relays and associated protective devices are set properly in order for the system to react as designed

Relion – product family offering the widest range of equipment for the protection, control, measurement and supervision of power systems.

ABB Services providing the formula for safety!