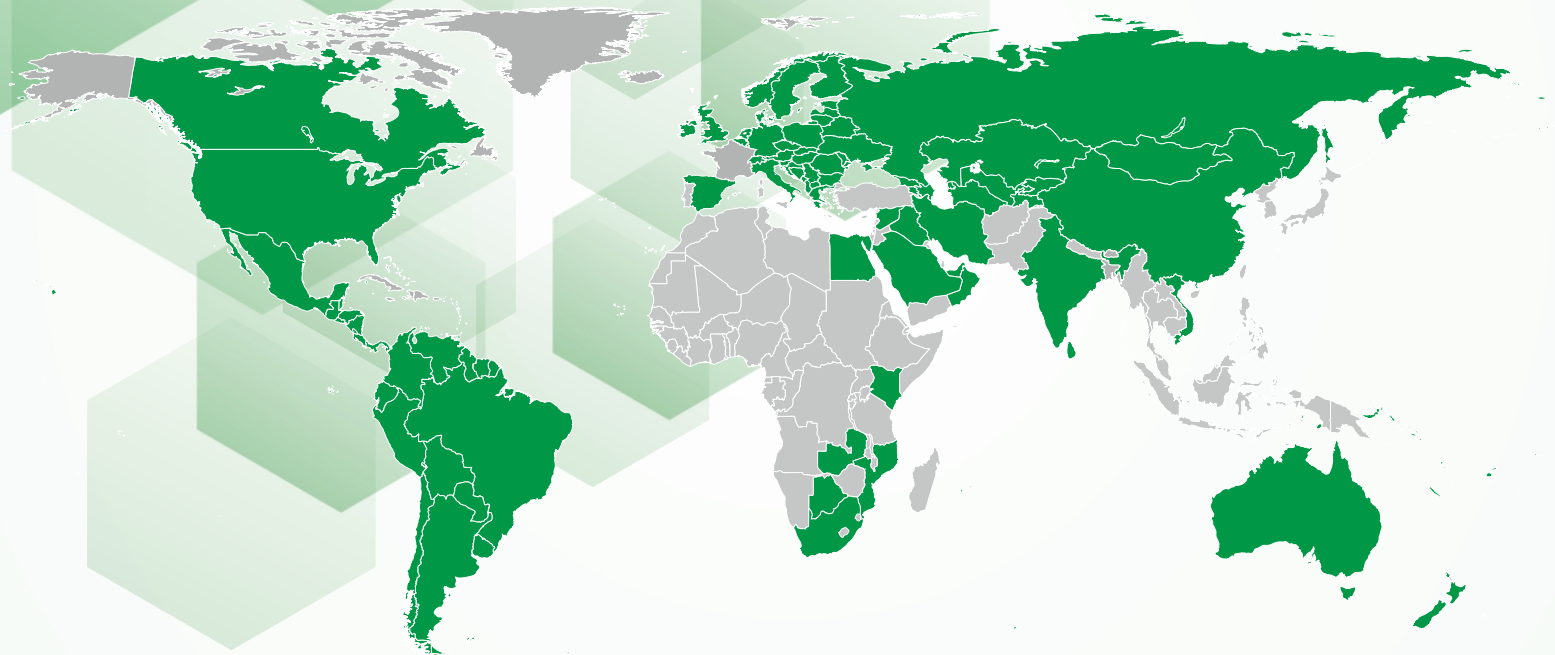


RETROFIT - A FEASIBLE SOLUTION FOR SWITCHGEAR LIFETIME EXTENSION

Tavrida Electric

Tavrida Electric offers a complete project approach for retrofit applications, commencing with the customer's problem and culminating with commissioning of the project at site. Customers can trust Tavrida Electric - founder of the retrofit approach, with its 25 years of professional experience in this global market.



"We offer customers retrofit solutions for all brands, including Legacy switchgear, giving them a new lease of life"

ABSTRACT

Legacy Circuit Breakers are still operating in many Utilities today. Most of these breakers have already exceeded their expected lifetime and are being considered for decommissioning. Originally installed circuit breakers may have become unsuitable for a number of reasons; such as their operational requirements, or their asset condition, or they may have a restricted network duty. Tavrida Electric offers a number of cost effective solutions to enable older equipment, that is no longer manufactured or in some cases not supported, to be retrofitted with a modern design circuit breaker in accordance with customers' current requirements. Our turn-key approach and universal retrofit kit (URK) applications offer a flexible solution to the customer's problem.

INTRODUCTION

Today, retrofit geography is spread over all continents. Most Utilities and industrial customers are aware of the concept of retrofit, as it has become one of the most viable methods for the rehabilitation of switchgear comprising obsolete equipment. Many companies offer retrofit solutions for switchgear they produced in the past (Legacy brands). But due to dimensional constraints, availability of the old trucks, lack of knowledge and experience, many of these manufacturers cannot offer solutions for retrofits of other brands. Tavrida Electric is capable of retrofitting a multitude of existing switchgear of any brand without limitations. This has become possible thanks to the world's smallest circuit breakers; the Tavrida Electric type LD and Shell series, which have enabled Tavrida Electric to acquire unique experience and knowledge throughout many years of retrofit activity.

Today, Tavrida Electric focuses on a project approach for our retrofit solutions, which provides the customer with not only the development and/or supply of the products, but complete management of the project by providing all services and products within the scope of the turn-key project. Working in partnership with our clients, our team is continuously developing new solutions to meet the challenges of retrofit applications, including RTU and SCADA integration, refurbishing of old trucks or manufacturing of new ones, project management and support from specialists in their fields. Our objective is to provide our customers with a reliable and cost effective alternative to total asset replacement, and all from one company – Tavrida Electric.

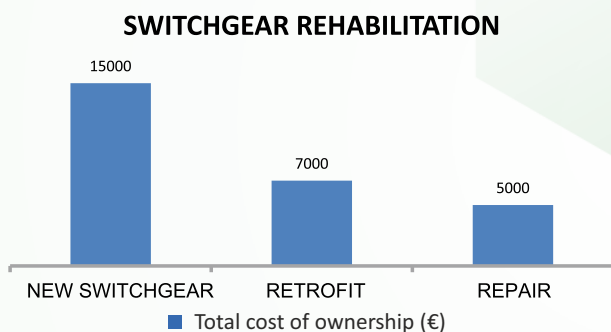


WHY RETROFIT?

Today a substantial part of investments are being put into renovation and modernisation of existing switchgear – retrofit, as enclosure and current carrying parts of the switchgear are less subject to deterioration and have a far longer lifetime than the switching device. Therefore to extend the overall lifetime of the switchgear, a new draw-out unit with a new circuit breaker is a technically feasible and very cost effective solution. Another reason behind retrofit's abundant demand is that other options such as new switchgear and repairs are not feasible in most cases, either because of cost, lead time, process downtime or quality. Such a predicament is caused by the fact that many switchgear companies have stopped their production and OEMs, that were manufacturing switchgear in the past, discarded their old technologies or lost contact with their suppliers, resulting in scarce availability of components, old trucks and schematics. Thus, the solutions that are offered in the market today are practically all bespoke, with overwhelming prices and lead times.

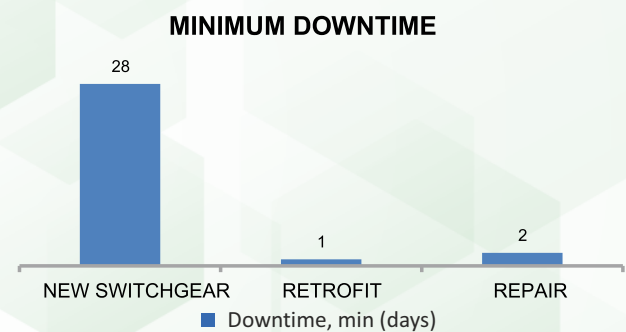
Value for money

Switchgear operators have a set investment plan and budget, which is the driving and, at the same time, limiting factor to any asset expenditure. Therefore, what is sought out in the market is the offer with the best value for money. The following graph illustrates a comparison of possible solutions for South Wales Switchgear type D4X renovation.



Minimising downtime

Downtime is a major factor, especially if the consumer belongs to key essential services (hospitals; fire brigade stations) or high demand consumers (huge process industries; intensively populated areas). For on-site work in some cases only 4-8 hours between shutdown and re-energising are permitted to perform a replacement of a single feeder.



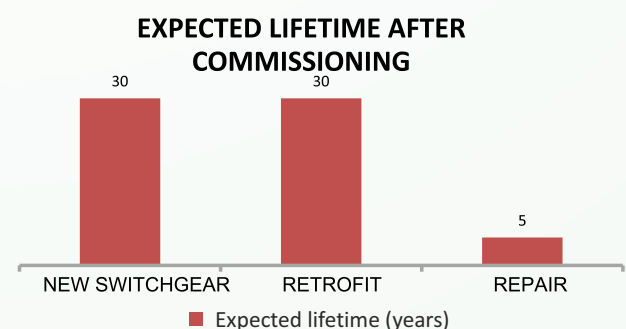
Project lead-time

Project lead time is a crucial factor as any downtime transforms into losses and additional expenditure to cover these losses. Certain sites do not allow extended downtimes, both due to economic and regulatory reasons.



Guarantee of investment

An old metal enclosure, primary insulation components and primary copper conductors are not subject to degradation during their whole lifetime, if operated under the correct environment. The circuit breaker is subject to the most strain and deterioration during operation. By replacing the CB and recovering related elements, the next 30 years of service are guaranteed for the switchgear.



WHY TAVRIDA ELECTRIC?

Tavrida Electric introduced the concept of retrofit to the world market 25 years ago. We accumulated a portfolio of over 180 different varieties of retrofit projects worldwide for fixed and withdrawable types of switchgear. Today we offer not only solutions and equipment, but also consulting, design and turn-key based project services.

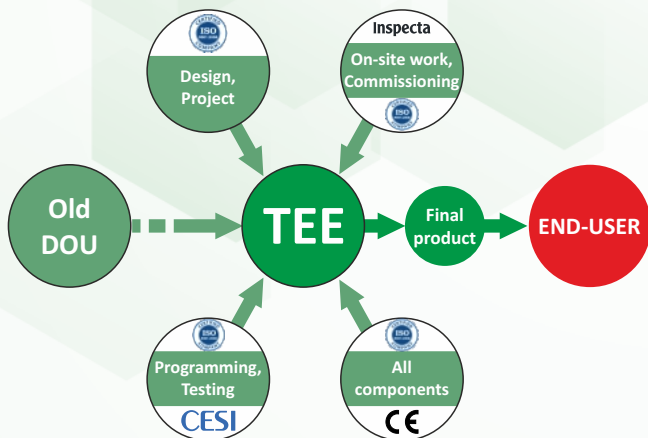
Project Approach

To ensure maximum efficiency, minimal costs, lead-time and downtime as well as quality, we offer the following services:

- Consulting: site inspection/condition analysis;
- Project design: primary/secondary circuits;
- Supply of core components;
- Manufacturing/Assembly of the final product;
- Complete routine/type tests;
- Installation/commissioning.

Our expertise and approach enable the customer to benefit from the following:

- All services and project management that are offered by Tavrida Electric;
- Core components are manufactured and the final product is assembled by Tavrida Electric;
- Aftersales services are provided by the original manufacturer;
- An extended warranty period up to 10 years for projects managed by Tavrida Electric.



Tavrida Electric Credentials

Management system: ISO9001; ISO14001

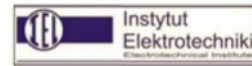


Personnel: Grade A, B



Product certification:

Independent well-known STL member labs



Product countries approvals:

Scandinavia, Baltic States,

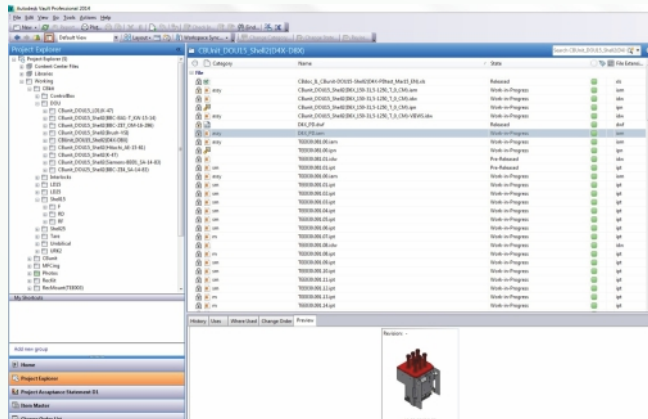
Central and Western Europe, GCC region, Egypt, Russia



Product utilities approvals:

ADDC, AADC, ADWEA, Elektrilevi, Tauron,

Sadales Tikls, E-On, ESO



Technical superiority

Due to variations in the standards, different technical requirements, local service conditions, the final retrofit solution must be equipped with modern, high-end components capable to cover not only high demands for technical parameters, but also capable to withstand sometimes abnormal ambient conditions, since the rehabilitation or renovation projects are often limited by budget, which does not include renovation of the substation's housing or ventilation, exposing the equipment to harsh environmental conditions.

Tavrida Electric offers superior retrofit solutions which:

- cover all existing legacy switchgear available in service;
- improve general technical characteristics, reliability and functionality by using high-end circuit breaker;
- improve operation safety levels by implementation of reliable mechanical interlocks and indication;
- easy integration of equipment into SCADA and automation schemes;
- widen normal service conditions far beyond the standard ones: $-40^{\circ}\text{C} \dots +55^{\circ}\text{C}$ ambient temperature range, 98% humidity;
- include the fastest circuit breaker with superior reliability and extended operational lifetime.

TEL circuit breaker highlights:

- O-0,3s-CO-10s-CO autoreclosing cycle
- 8ms for Open and 15ms for Close operation
- Normal service conditions: $-40^{\circ} \dots +55^{\circ}\text{C}$; 98% humidity
- Lightweight, 54 kg is the heaviest circuit breaker model
- E2, S2, M2, C2 class circuit breaker
- Tested in independent international laboratories
- 30.000* and 50.000* CO operations mechanical and electrical lifetime
- Most compact circuit breaker

*-mechanical life certified

** - As per NFPA 70E Table 130.7 (C)(11) and IEEE Std 1584-2002

Personnel safety

One of the problems of old switchgear is that they are not IA classified, as this concept was not applicable at the time. Therefore arc protection was not present at the time.



To guarantee safety of working personnel the only options available for old switchgear are:

- Arc-flash protection
- Safe manual close

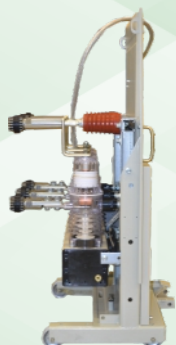
The former is achieved by a joint use of fast switching CB and fast acting arc protection relay, the latter is possible by using a manual close generator with an extension cord for the operator to close the CB from a safe distance.

Tavrida Electric circuit breaker is the fastest switching CB on the market, and combined with advanced arc protection systems can deliver arc extinguishing times as short as 1 period (50Hz) time - $< 20\text{ms}$, which by international standards corresponds to Risk/Hazard Category "0" **.

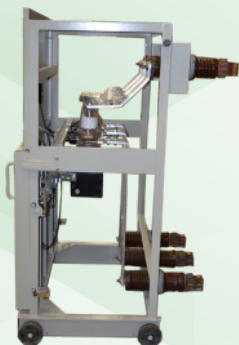


TRUSTED EXPERIENCE WORLDWIDE

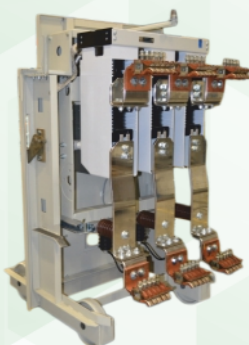
Baltic countries



K-104



K-Vlu



K-12



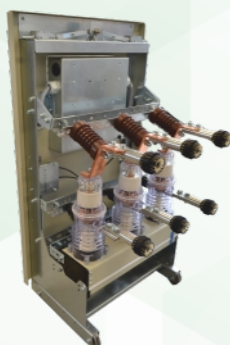
K2-03



K-34



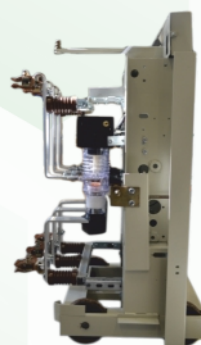
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K-47



KRU 2-10



K-13

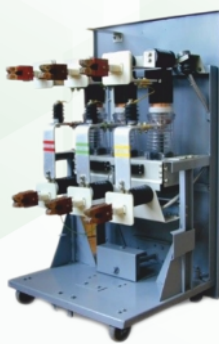


KVP-6-13

Eastern Europe



SCI



ZWAR



Koncar

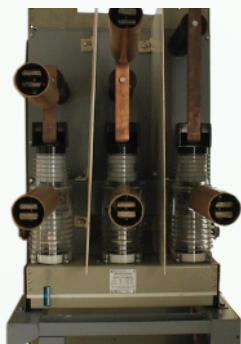


Minel



IO

North Africa



TSN



WMSWP



SAEC



CSIM

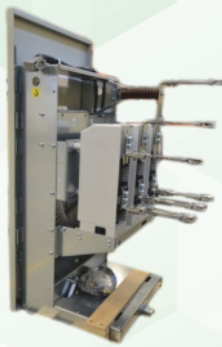


Skoda

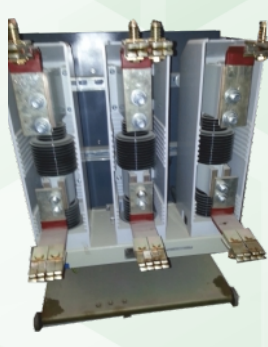
GCC countries



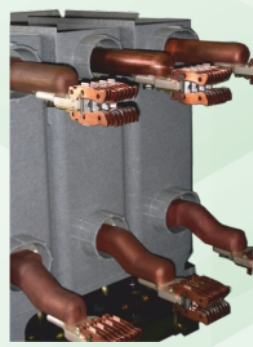
Hawker Siddeley D4X



SIEMENS 8BD1-3AC



HITACHI HS10SG



VPR



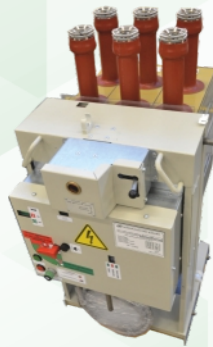
AEG/Sachsenwerk



BBC ZE7



HITACHI Solenarc



Reyrolle LMT



BVP



BBC ZE4

Scandinavia, Finland



HITACHI MGH10



ASEA HKK



ASEA



OSAM-P2

Tavrida Electric retrofit solution benefits

Tavrida Electric products have always stood for high quality and reliability. Our engineering expertise and innovative design have brought out the full potential of Tavrida vacuum circuit breaker technology enabling its use in a multitude of projects all around the world. Tavrida Electric's clients benefit from our professional and experienced engineers, innovative designers, professional workshop and modern manufacturing line. Our team is ready to undertake any retrofit project, be it from our existing portfolio or a custom design. We guarantee our clients a solution that will meet their needs within the shortest time frame and on favourable conditions.



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