TAVRIDA ELECTRIC

ISO 9001 and ISO 14001 certification

FAST TRANSFER SWITCH

Why is the continuity of supply important?

Uninterruptable power supply is crucial to Industrial and Petroleum companies that operate continuous production lines or processes. Outages of power supply, even momentary interruptions, can cause severe damage to production equipment and damage the products being processed. Apart from the disastrous financial risks, a power failure can also jeopardize an operator's life. Chemical and Petrochemical plants, Logistics and Printing companies, Metal works, Power and Desalination plants, Oil Production and Transport companies and many others face daily challenges to secure permanent availability of electricity due to internal or external short-circuit faults or power cuts for maintenance of equipment.

Chemical and petrochemical plants

Logistics and printing

Metallurgy

Pipelines

Power plants

Automotive plants

Semiconductor manufacturing

Papermaking

Refinery and oil production

Computer controlled production lines

In order to ensure continuity of power supply, two independent incoming feeders are usually provided to switch the load over to a healthy source when required. Conventional Transfer Systems based on an under-voltage protection have to be coordinated with protection relays of adjacent feeders and the reclosing relay of an upstream breaker. This results in a time delay of as long as several seconds.

Equipment or Processes at Risk

The ability to connect the load to a healthy power source within seconds will not retain the power supply intact. For instance, in the event of a power loss of only 50ms, there is a drop in voltage of 70% of the rated voltage, causing the magnetic contactors to trip. Consequently, MV and LV motors come to a stop bringing the whole production line or process to a halt. Thus, the industry needs a much faster transfer system to eliminate the risk of power interruption.

EXAMPLE:
As a result of operations in 2009, ROSNEFT reported a loss of 198 tons of crude oil due to the use of Conventional Transfer Systems in the power supply of a hub consisting of 10 oil pumping stations. Taking into consideration today's oil price the losses amounted to the sum of USD 164 391.

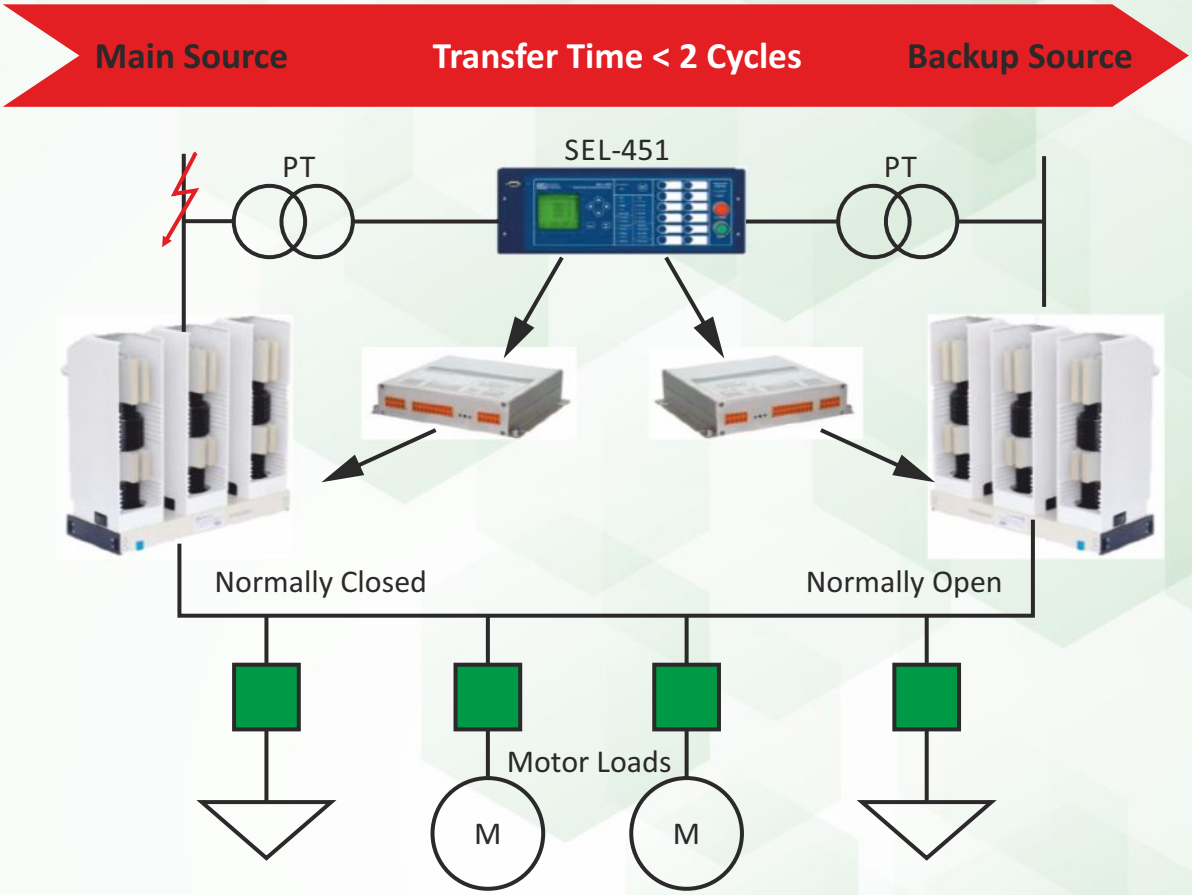
This example clearly demonstrates that a downtime is expensive and also offers an opportunity for Fast Transfer Switch application as a project with a quick return on investment.

The table below summarizes the threats long transfer times can pose.

Sensitive equipment	**Potential threats vs. Transfer times**		
		Power loss	
	< 50ms	**50ms - 1s**	**> 1s**
Medium voltage motors, pumps	Voltage dips cause MV motors to slow down due to the loss of power at the source supply. Motor protection should trip the line to reduce the risk of overheating and short circuiting of windings. Some time is required then to start up the motors, surmounting stresses of inrush currents. The IN-PHASE transfer to the healthy source in less than 50ms affects neither motor nor load characteristics, keeping the technological process running.		
Aftereffects	**No impact**	**Stressful restart**	**Complete halt**
Low voltage motors	No direct threat to the motors, however due to their self-restart, the supply voltage drops to a critical level, which results in control contactors tripping and consequent motor supply voltage loss.		
Aftereffects	**No impact**	**Stressful restart**	**Complete halt**
Magnetic contactors	The voltage drop level is critically dependent on time. After 50ms of control voltage loss, the residual voltage level becomes critically low, which makes the magnetic contactors trip.		
Aftereffects	**No impact**	**Complete halt**	**Complete halt**
Soft starters, frequency converters	Device self-restart, loss of motor control. Protection trips the load after 1s of voltage loss.		
Aftereffects	**No impact**	**Protracted restart**	**Complete halt**
PLC, computer controlled systems	Loss of control, protection stops the process.		
Aftereffects	**No impact**	**Protracted restart**	**Complete halt**
Protection devices, signaling and alarming	Loss of protection, signaling or alarming.		
Aftereffects	**No impact**	**No impact**	**Protracted restart, Loss of communication**

Fast Transfer Switch

Tavrida Electric in cooperation with Schweitzer Engineering Laboratories (SEL)*, introduces its Fast Transfer Switch System based on the fast response time of the SEL controller (7-10ms) and the ultimate characteristics of Tavrida circuit breakers.



In case of a fault in the main power source, the system switches over to a backup source within ~32ms (less than 2 cycles).

The reliable fault condition determination is provided by the SEL 451 relay, which fully eliminates false triggerings.

SEL 451

- Overcurrent, undervoltage/underfrequency; phase angle, static load (I_{max}, U_{min}, δ_{12}, P + jQ, I_{min})
- Response time 7-10mS
- Ability to work with symmetrical or non-symmetrical short circuit
- Complete current and voltage protection of 2 sources feeders
- Complete independent control of 2 VCBs and supervision of the third
- Ability to work with/without motor load (residual voltage dependence)

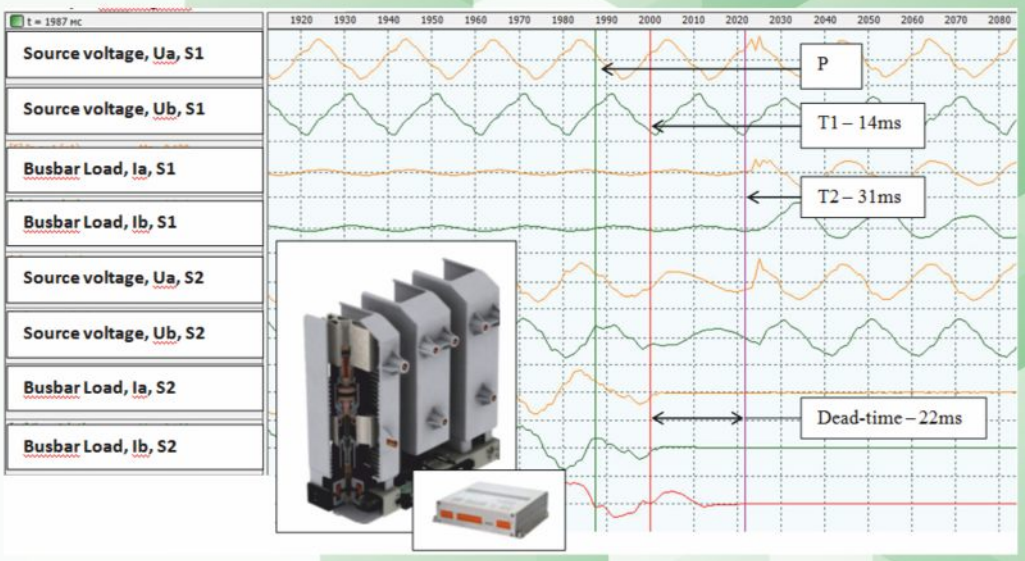
Tavrida circuit breakers have the fastest characteristics (opening and closing times) on the market, thanks to their simple and reliable mechanism with linear movement of the drive and few moving parts. The need for maintenance is completely eliminated since the breaker is maintenance free during its entire mechanical and electrical life.

Tavrida VCB

- Rated current up to 2500A
- Mechanical and electrical life up to 150000 CO
- Rated breaking current up 31.5kA
- Control module reaction time - 4ms
- Opening time - 8ms
- Closing time - 18ms

* SEL is a trademark of Schweitzer Engineering Laboratories

FTS sample oscillogram:



Where:
S1 Circuit breaker 1;
S2 Circuit breaker 2;
P = SEL 451 relay pick-up;
T1 = 14ms – tripping time of S2 circuit breaker including SEL relay pick up, control module reaction time;
T2 = 32ms – closing time of S1 circuit breaker including SEL relay pick up, control module reaction time;
D = 22ms – dead-time.

In total, the operating time of the FTS is ~32ms (including the pick-up and operating time of the SEL relay, the operating time of the CM control modules, and closing time of S2 VCB).

In this application the dead-time is equal to **22ms**, which ensures no potential threat to either sensitive equipment or production process.

FTS Benefits

FTS provides a continuous and reliable power supply to eliminate costly downtimes and improves the plant load factor.
FTS ensures low investment costs and a quick return on investment.
FTS reduces production equipment stress and fatigue prolonging its service life and minimizing O&M costs.
FTS features local and SCADA control, event log and oscillography as well as advanced user software.
FTS is applicable for retrofit or brand-new installations.
FTS decreases the risk of environmental disasters.

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