Wilorton Holding

Design, Engineering, Manufacturing and Project Management expertise on Power Lines & Power Generation Industry,
Oil & Gas OEM spare parts, Mechanical works, Process Automation, Technical & Procurement services end-to-end solutions, since 1998

REV. 2021-09

CASE STUDY: 11-33/34.5 kV T&D Lines

leakage currents, short circuits & current interruptions
ARE FREQUENTLY CAUSED BY POLLUTED INSULATORS

SCOPE: Preventive Maintenance Without Power Outage
for 11-33/34.5 kV T&D Lines T&D Power Line

Everyone involved in power utilities sees leakage currents power outages on its transmission and distribution lines caused by polluted insulators.

Outdoor insulators are subject to surface dirt deposits to some degree and in all operational areas. Most encountered contaminants have little effect on insulator performance as long as the surface is dry.



Watch Live Line Washing of Polluted Insulators:
https://youtu.be/OzsypvkyP8E / https://youtu.be/o-iMVBj9WKM

A seasonally adjusted washing maintenance program focused on cleaning energized and POLLUTED insulators help eliminate leakage currents, flashovers, and power outages.

Wilorton Holding Inc.
Road Town VG1110 Tortola British Virgin Island
Customer Support Office Mail Address: c/o Fiam SA Via Carlo Frasca, 3 - 6901 Lugano - Switzerland
Tel. Pbx: +41(0)91 695 1070 - email: css@wilorton.info - web: https://www.wilorton.com

Preventing T&D power interruption attain operational excellence, reduces the risk of downtime, and achieves financial and maintenance budget efficiency.

11-33/34.5 kV T&D Line, configuration details:

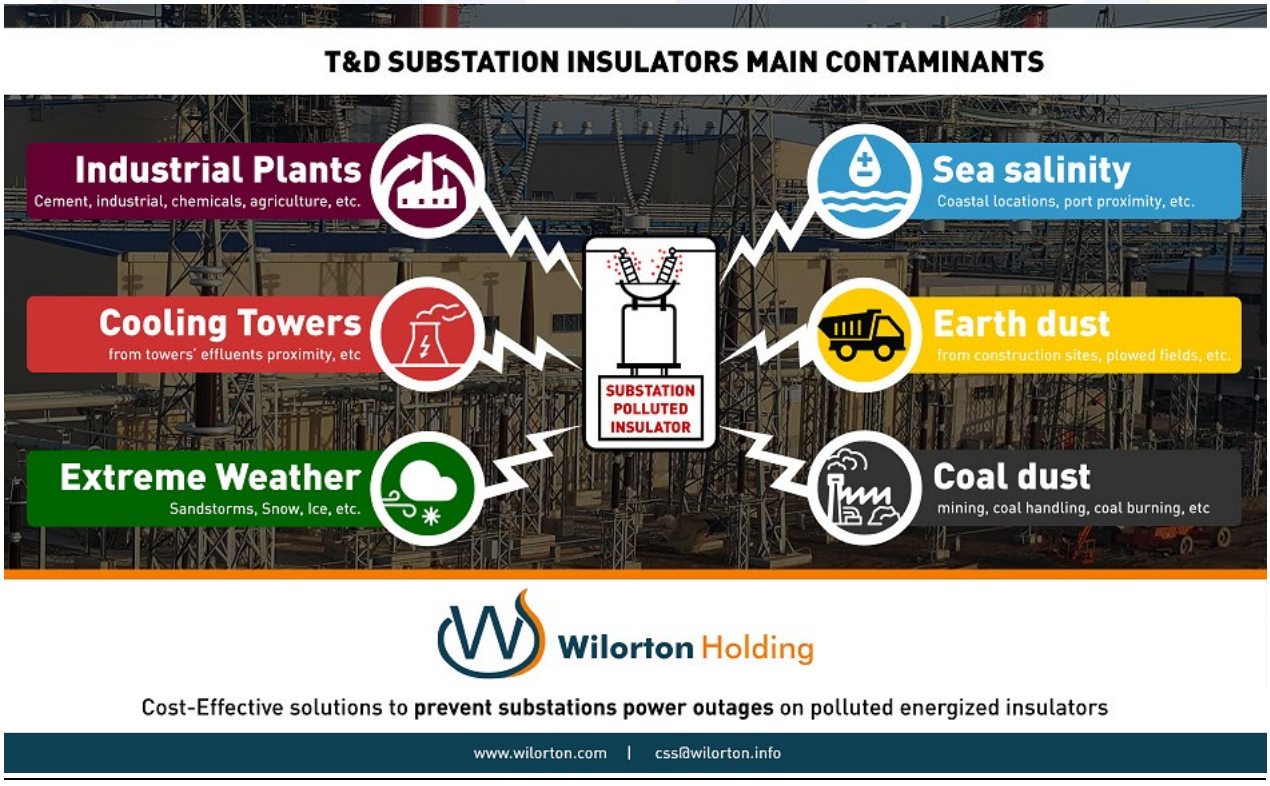
- The span between poles: ~100 meters
- Insulators per pole: Nos. Three up to 21
- Pole's height: ~12 meters from GL (Ground Level)

NOTE:
The insulators are subject to dirt deposits, and the pollutants builds-up gradually during dry and hot weather seasons without decreasing the insulation strength. The insulation strength does not decrease when the insulators are dry.

Fog, mist, or light rain usually creates conditions that produce a conducting film on the dirty insulator surface without washing the impurities from the surface.

When the polluted insulators become wet, a conductive layer forms on the contaminated insulator surface, initiating leakage current.

Outdoor bushings/insulators are subject to surface dirt deposits to some degree and in all operational areas. Most encountered contaminants have little effect on insulator performance as long as the surface is dry.



To prevent "power outages" when a contaminant-related failure takes out a line,

- rather than running the risk of having multiple flashovers,
- to increase the power supply reliability for uninterrupted performance and higher productivity, among other factors, financial efficiency,
- we have proposed an energized (hotline) insulators MOBILE washing system to the user.

As standard procedure, the MOBILE washing system washes the energized polluted insulators with a custom maintenance program seasonally adjusted.

MOBILE washing system, overview:



Mobile washer **MK-S** – SEMI-TRAILER configuration



Mobile washer **MK-S** – SKID configuration



Mobile washer **MK-S** – SKID **COMPACT** configuration
Truck-mounted

The operator, positioning himself near the pole, pulls & holds one high-pressure flexible hose with a spray gun to wash the energized insulators from GL (Ground Level).

A minimum safe washing distance from the spray gun tip to any energized conductor to consider is approx. 2 m (11 kV line) and 3 m (33/34.5 kV)

Estimated wash timing to clean approx. 8 km of 11-33/34.5 T&D Line (WITHOUT POWER OUTAGE)

With a Mobile washer **MK-S-4C** SKID mounted, loaded onto a truck or trailer or any suitable vehicle, positioned near T&D Line, configured as herewith detailed:

- Storage water tank capacity: 4 CM (Cubic Meter)
- No. 1 (one) spray gun
- Nos. 1+1 washing operators
- Demi-water consumption: 4 CM (Cubic meter)

Washing activity timing to wash approx. 8 Km of 11-33/34.5 kV T&D Line: 4 hours

- Washing time is calculated in **NO-WIND conditions**.
- One Insulator's estimated washing time: 5/10"

NOTE:

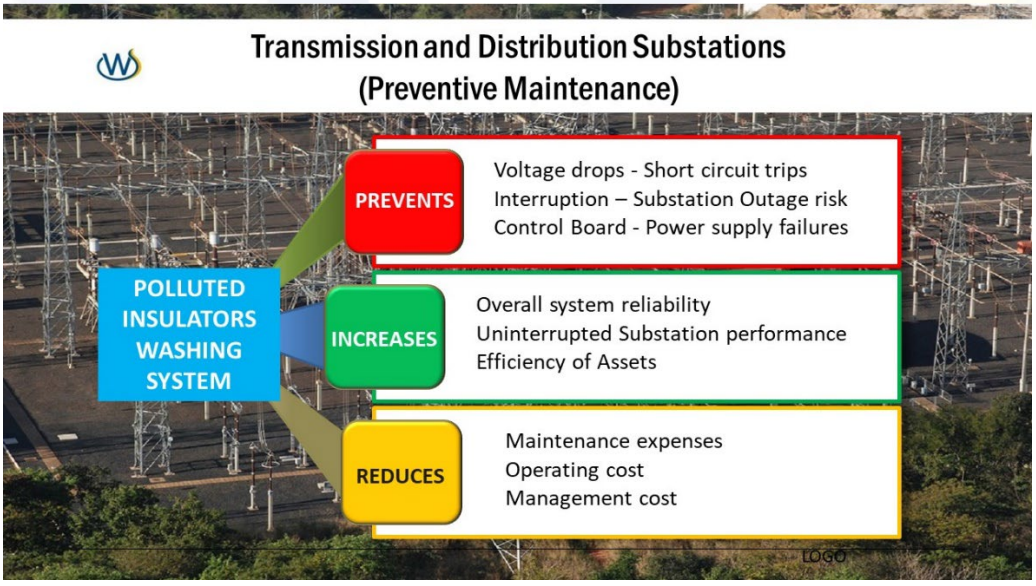
- In high wind conditions, the washing jet will be dispersed, and it will be ineffective.
- The skid washer unit is liftable and unloadable, freeing the vehicle for other activity if not needed for a lengthy time.
- The skid washer unit might be used to clean substations or power lines energized insulators/bushings of higher kV rating.
- The minimum safe washing distance from any energized conductor and demineralized water quality requirement is dictated by line kV rating (view table 4).
- Note: Nozzle-to-conductor distance for a given line voltage and nozzle diameter is the most crucial parameter that influences the water stream's leakage current and the washing effectiveness.

Table 4—Minimum distance for energized washing[a]

Line voltage	Minimum nozzle-to-conductor distance	Minimum water resistivity	Minimum nozzle pressure	Maximum orifice diameter
(kV)	(m)	(Ω·cm)	(kPa)	(mm)
13 & below	1.82	1300	2758	4.76
13 & below	1.82	1300	2758	6.35
16	2.13	1300	2758	4.76
34.5	2.44	1300	2758	6.35
34.5	2.44	1300	2758	4.76

Demi-Water pressure, washing frequency:

- The spraying water pressure may vary from 350 kPa to 3000 kPa (50 psi to 430 psi).
- The spraying water pressure depends on the type of contaminant to be washed and the type of Insulator installed
- The type of contaminant and its buildup rate dictate the washing frequency.



Follow our Insulator Washing systems showcase page on LinkedIn: https://cutt.ly/treL4LU.

BUDGETARY ESTIMATION

Wilorton scope: supply one (1) skid mounted and transportable mobile washer unit for cleaning all the energized Insulators installed on 11-33/34.5 T&D lines.

Included: a customized seasonally adjusted preventive maintenance washing program (User interruptions history report is helpful).

MK-S WASHER SERIES Equipment General Specifications

- MK-S-4C unit, SKID MOUNTED with four parallelepiped tank shapes and loaded onto any available and suitable vehicle (truck/chassis/trailer/aerial platform).

QTY 1 HIGH-PRESSURE CENTRIFUGAL PUMP DRIVEN BY DIESEL ENGINE

PUMP RPM	CAPACITY	WORKING PRESSURE (*)
2900	400 LT/MIN.	30

- (*) At spray nozzle tip.
- Diesel Direct Injection, Turbocharged, Water-cooled

QTY 1 PORTABLE WATER CONDUCTIVITY TESTER

- Accuracy of ±1% of reading ±.2% at Calibration Point
- Automatic Temperature Compensation, auto-ranging, durable, fully encapsulated electronics,
- Waterproof powered by 1 N Type Battery

QTY 1 CONSTANT WATER CONDUCTIVITY MONITOR

- Constant Water Conductivity Monitor provided in Tank continuously measures the water conductivity and tripping the pump with water quality not suitable for energized insulators washing.

QTY 1 SPRAY GUN

- No fluid passage upon trigger release.
- Covered by shockproof plastic semi-housings
- Sturdy construction of stainless steel & brass with dynamic Teflon seals
- Gun design for continuous use at a water temperature of 60°C (140°F).
- Attention: to prevent any risk of INSTABILITY of the gun due to pressure spikes, the use of safety devices (SHOULDER REST) is recommended and included.

QTY 1 HOSE REEL WITH 1" HIGH-PRESSURE HOSE

- Hose Reel – Electric and mechanical rewind, length 45 m, non-conductive flexible hose with quick coupler. Max. Working pressure 88 Bar burst pressure 350 Bar.

QTY 1 WATER TANK 4 CUBIC METER CAPACITY

- Stainless steel AISI-304 material grade, parallelepiped (Compact series) shape, complete with:

WATER TANK 4 CUBIC METER CAPACITY, Cont'd

- Stainless steel Manhole with automatic breathing vent valve, Stainless steel drain, outlet, by-pass connections, Visual external water level. Ladder with service platform to access the water tank manhole.
- Stainless steel AISI316, ball valves, and fittings. Strainer filter, Magnetic Water Level Switch: at 500 mm from bottom Alarm start (Warning level), at 150 mm from bottom Pump Stop, Rotating warning alarm lamp, Lifting eyes.

QTY 1 GROUNDING SYSTEM

- Grounding Reel with 30 m Length of grounding cable with suitable clamp, manual rewind

QTY 1 CONTROL PANEL

- Controls/protection:
- (Diesel engine) - low oil pressure, over-temperature, belt breakage, minimum fuel level, air filter clogging, cooling low liquid level, over speed, under-speed, hour display, oil pressure, oil/water temperature, tachometer, fuel level.
- (Alarm/Signals/Settings) - Minimum water level alarm (Warning level), minimum water level alarm (Shutdown level), water conductivity control, conductivity level, conductivity level settings, battery/oil lights, maintenance warning request, emergency Stop.

QTY 1 EXTRA HEAVY-DUTY FRAME

- Fabricated in Tubular Mild Steel, epoxy painted to support the washing equipment, suitable for fixing onto the trailer/truck-chassis or aerial platform. Including one (1) lockable storage compartment for accessories and tools.

MK-S-4C with PARALLELEPIPED TANK - Overall Dimensions/Weight (Approx.):

Overall dimension: W 2.0 x L 5.0 x H 2.0 - Weight Kg: Empty Tank 3.500 – Full Tank 7.500

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Budgetary equipment costing:

NET PRICES MK-S-4C: Starting from €55.500.00

Optional Service(s):

– Job-site training (*)	€3.200.00
– 2 Years spare parts	€2.560.00
– Safety clothing for energized works	€750.00 (Glasses, Insulated Gloves/ Boots Helmet, cloths)

(*) Job Site Training: For six people, five workdays. Excluding air ticket, inland transportation, and lodging, visa charges, if any, for the Trainer(s)

Equipment / Upgrade(s) on request:

- Demi-water treatment unit
- 6/8/10/15/20 CM (Cubic Meter) or higher tank capacity for extended washing activity
- Motor-pump enclosure. Two meters custom ladder for washing pole's height of approx. 15 m

SUPPLY GENERAL TERMS & CONDITIONS	
Payment:	By irrevocable and confirmed L/C.
Estimated Time of Delivery:	Starting from 10/12 weeks from receipt and confirmation of a clarified order and L/C. For a shorter delivery time, pls. apply
Warranty period:	24 months from FOB date
After-sales guarantee:	Spare parts availability and technical support, ten years from delivery
Goods Origin:	Italy
Validity,	Until 31-12-2022

Wilorton Holding Inc.