

TR.ELECTRIC



BRIDEX |  Fuji SMBE

TRANSEC

Online Moisture monitoring & drying solutions
for oil insulated transformers

PR

WHAT IS A TRANSFORMER?



WHAT IS A TRANSFORMER?

- Most expensive equipment in the Power system chain
- Used to transfer electrical energy between 2 circuits

USED IN



Industry



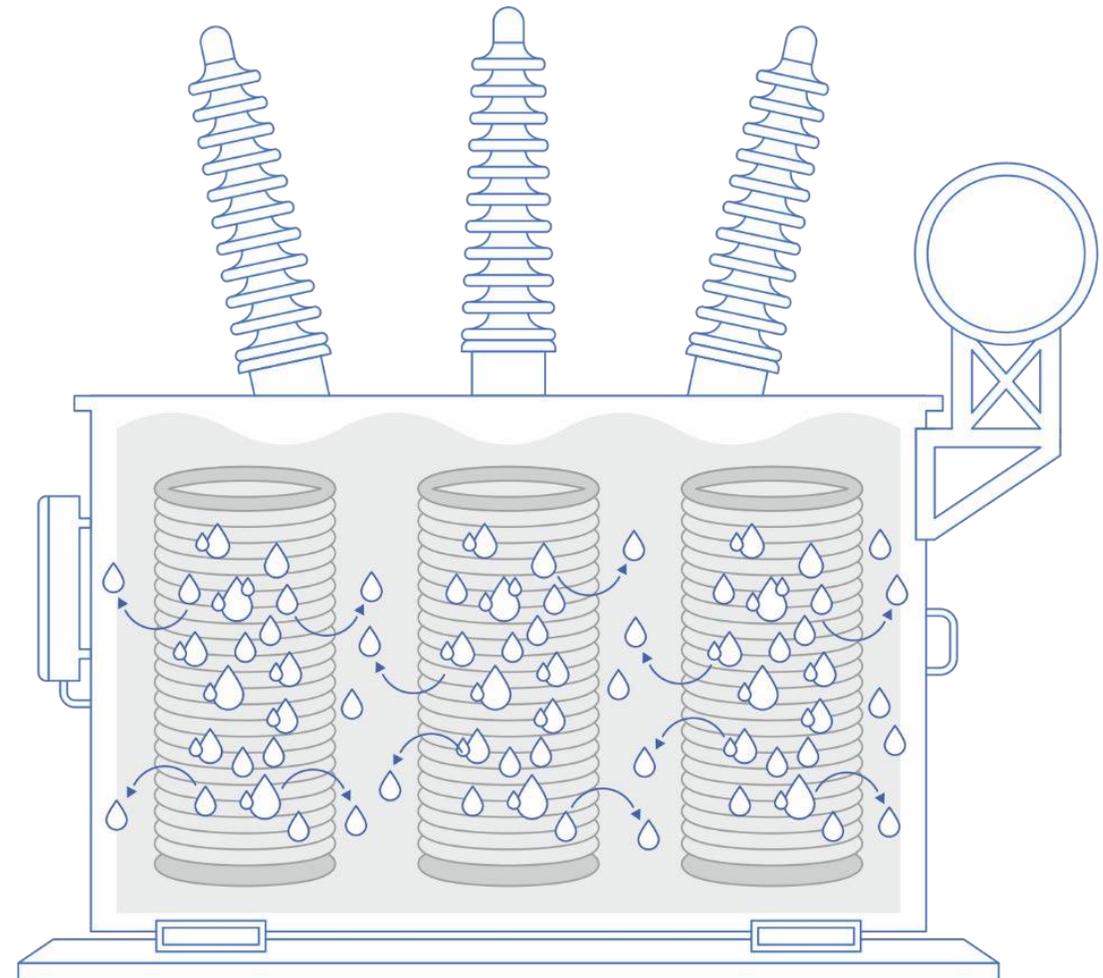
Distribution



Transmission



Power
Generation



WHAT IS A TRANSFORMER?

- Several sizes and types of transformers
- From a few kVA to several hundreds of MVA

PMT



CAST RESIN

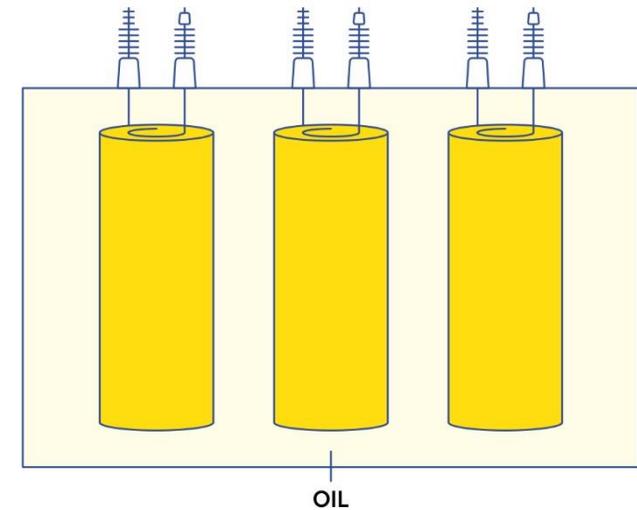
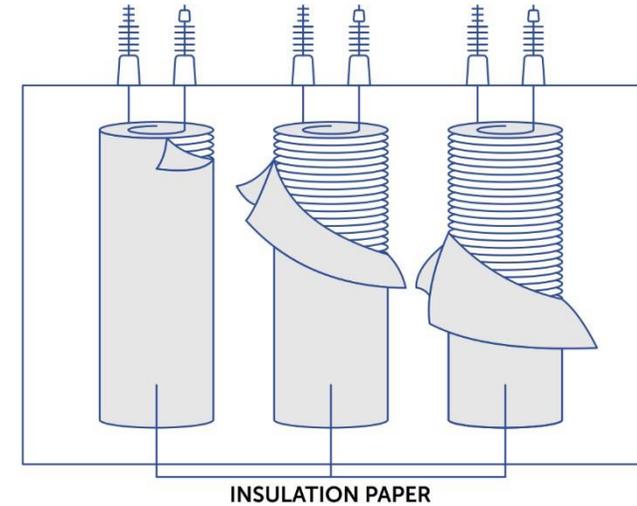


WHAT IS A TRANSFORMER?

- Thin steel plates and copper windings
- Insulated with pressboard sheets and plates (cellulose material)
- All of it is immersed in oil
- Oil has excellent insulation properties and is also used for cooling down the transformer

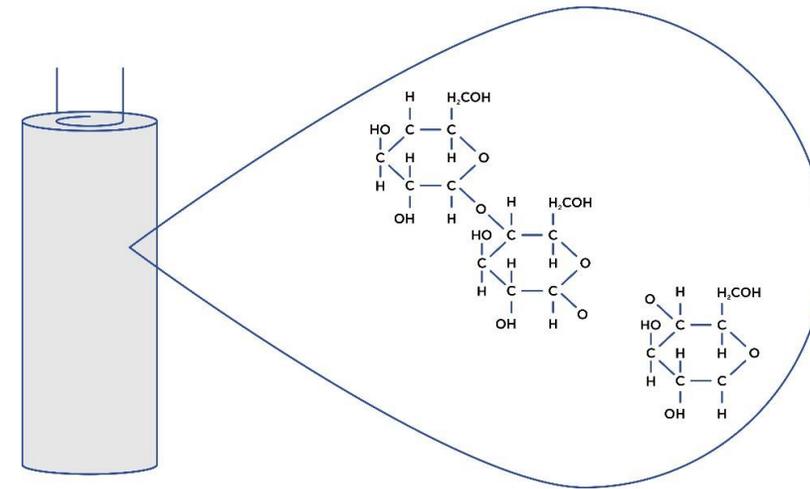
Oil and Insulation paper are both contributing to the **BREAKDOWN VOLTAGE** and therefore to the **SAFETY** of the transformer.

The breakdown voltage (BDV) indicates how well insulating oil can withstand an electrical load.



WHAT IS A TRANSFORMER?

- Transformer **LIFE EXPECTANCY** is directly linked to the status of the insulation cellulose paper
- The paper quality is defined by the **DEGREE OF POLYMERIZATION (DP)** which represents the average length of cellulose chain.
- New transformer have DP = 1200 to 1000
- End of life when DP = 200
- Decrease can be fast or long depending of life conditions (like human)
- Examples of element affecting the paper: temperature, acidity and **MOISTURE**



NEW



OLD



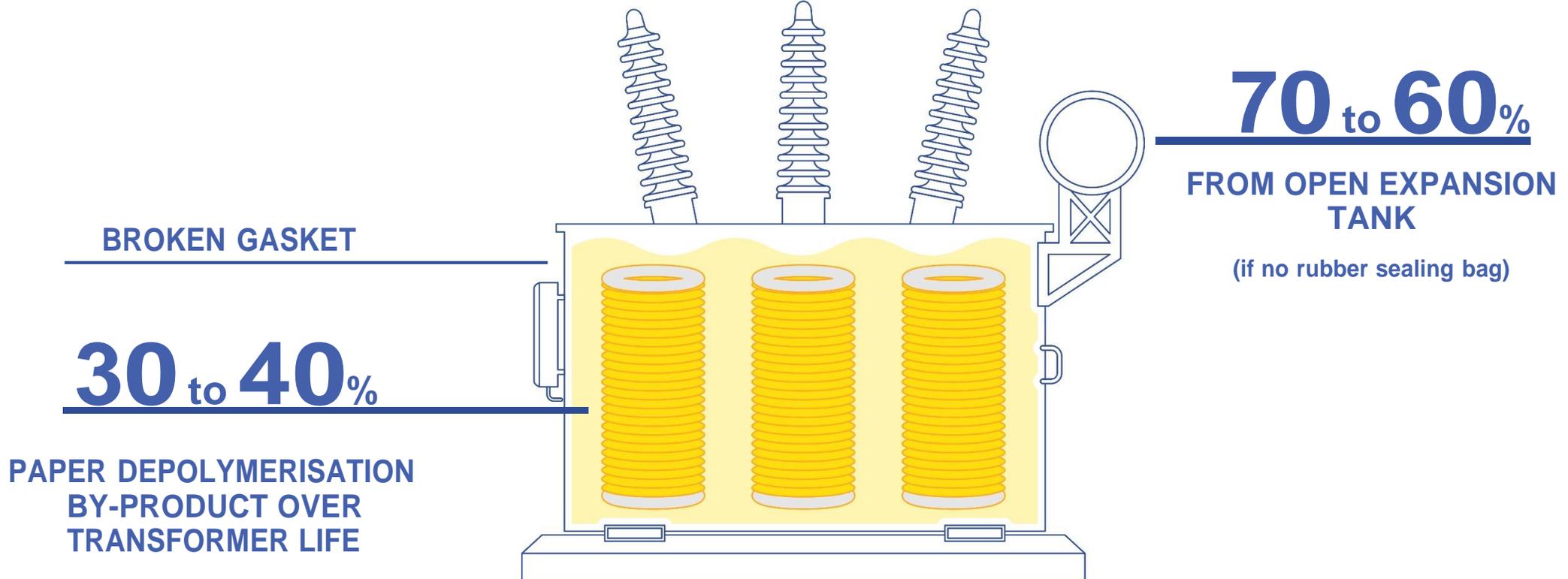
MOISTURE IN TRANSFORMER?

- WHERE DOES IT COME FROM?
- WHERE IS IT?
- HOW TO QUANTIFY ITS VOLUME?



MOISTURE IN TRANSFORMER: WHERE DOES IT COME FROM?

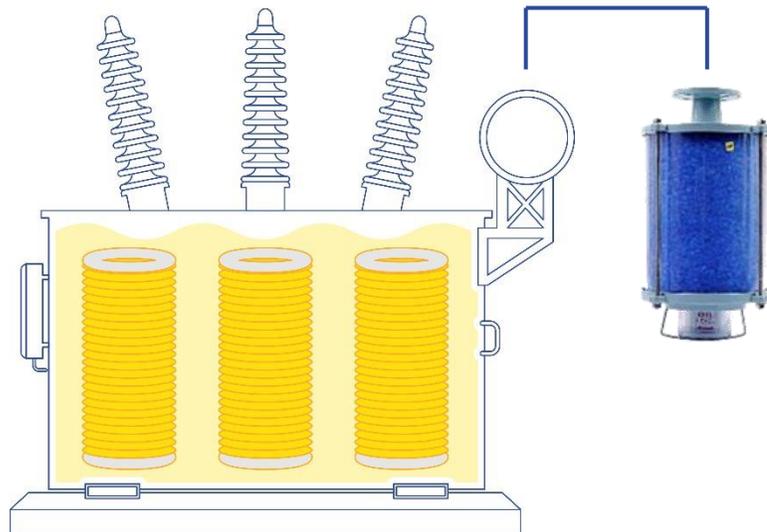
EXPOSURE TO AIR (REPAIR)



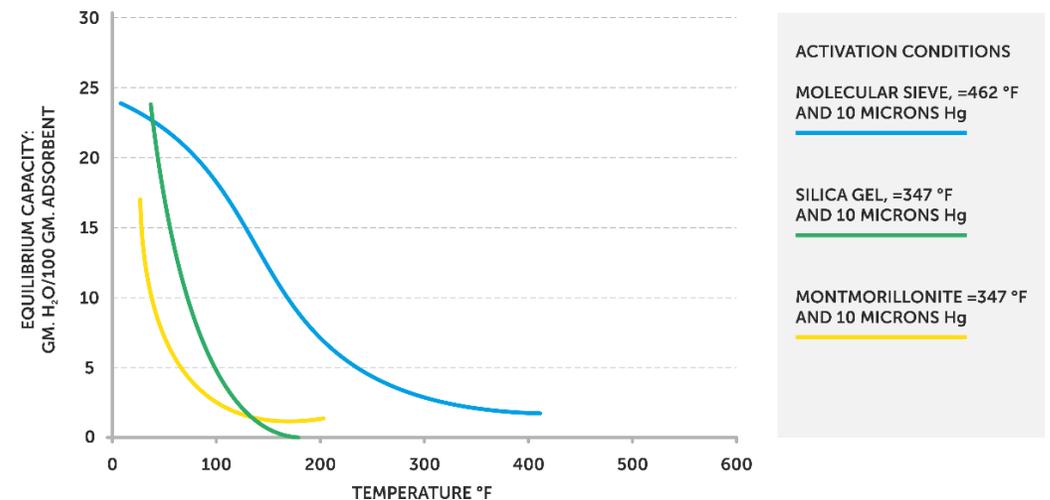
MOISTURE IN TRANSFORMER: WHERE DOES IT COME FROM?

INGRESS THROUGH THE BREATHER (IF NO RUBBER BAG)

- Silica gel extraction capability is not 100%.
- It also varies with temperature.
- At high temperature the efficiency is lower.



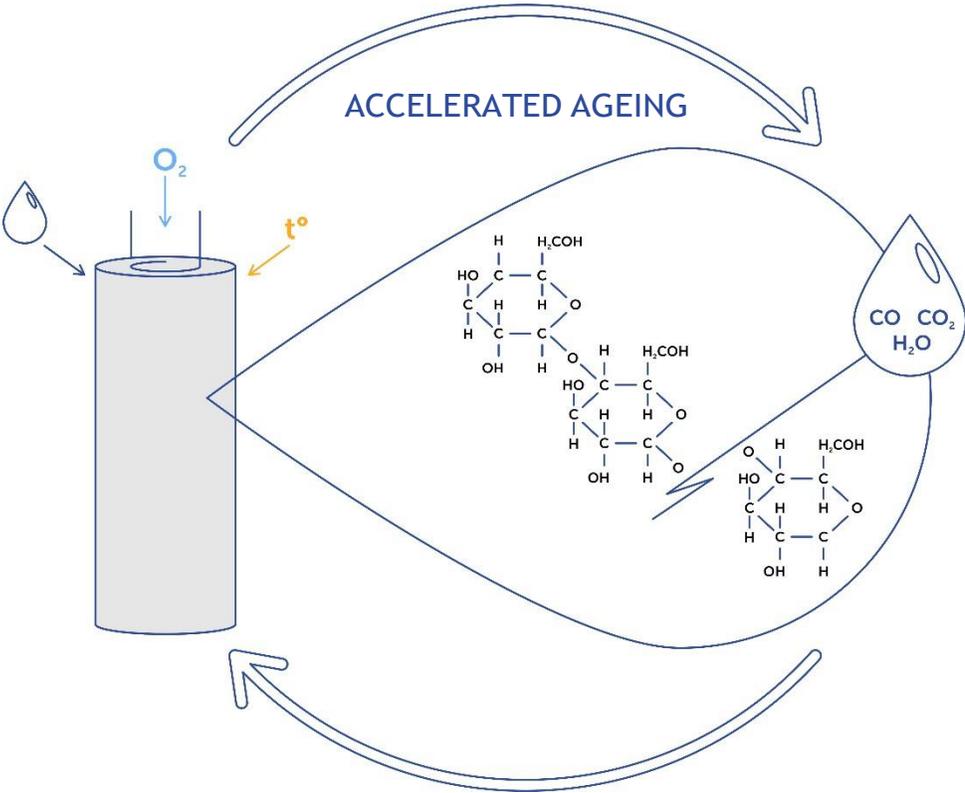
- The more the load is changing, the more there are exchanges with outside.
- Therefore more risk of ingress.
- If outside air is very humid (>80%), it is hard to dry it to 0%



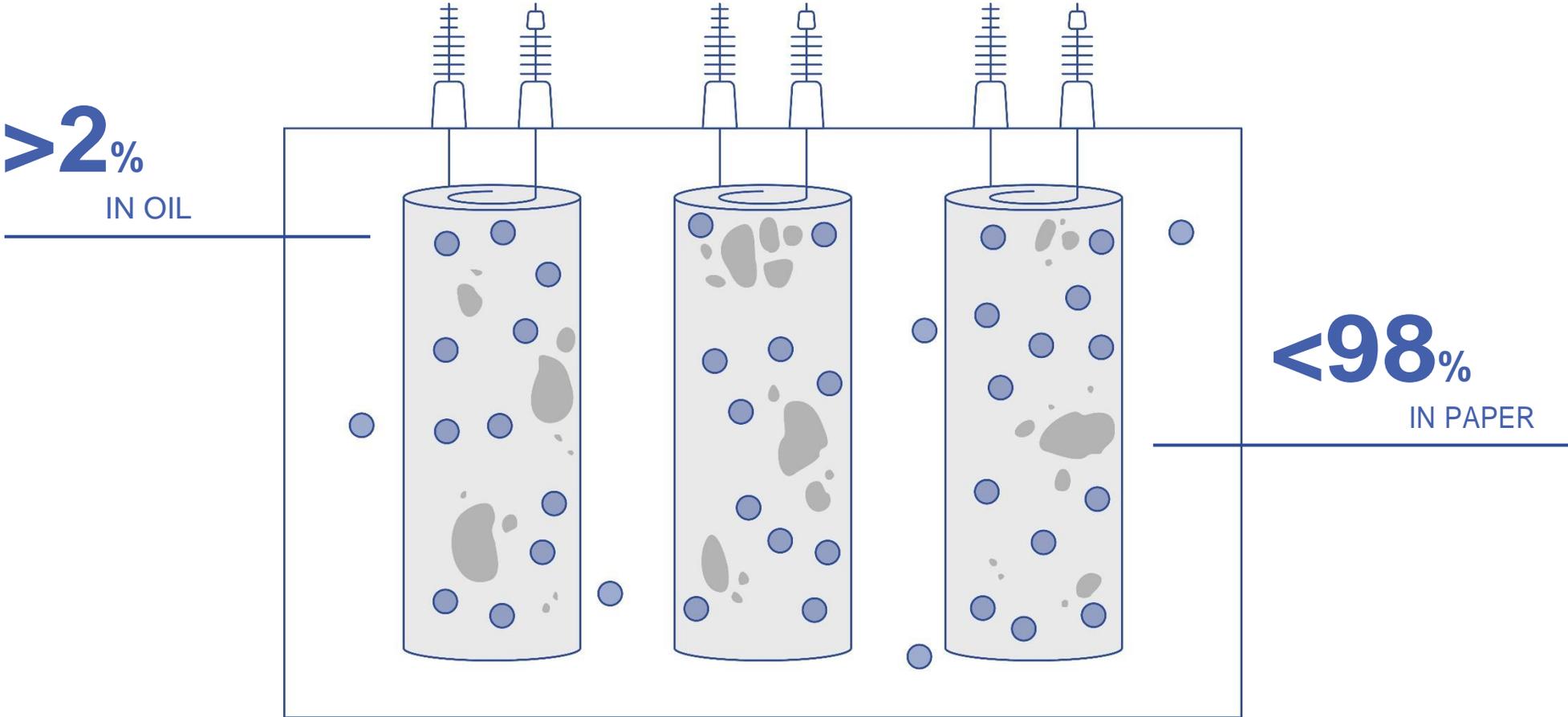
MOISTURE IN TRANSFORMER: WHERE DOES IT COME FROM?



PAPER DEPOLYMERISATION



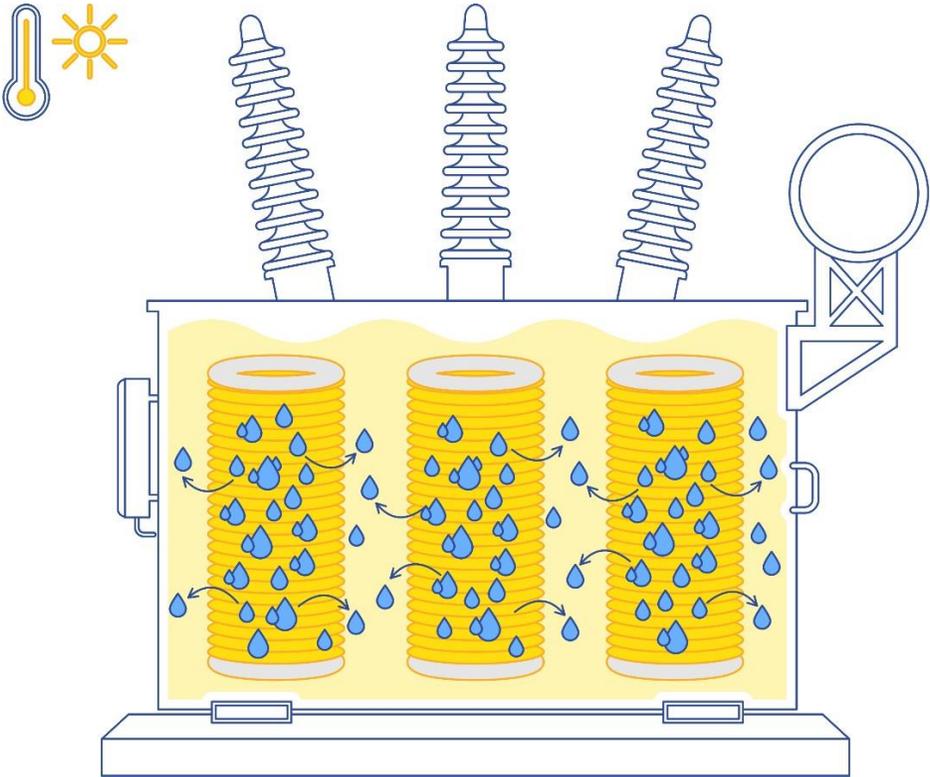
MOISTURE IN TRANSFORMER: WHERE IS IT?



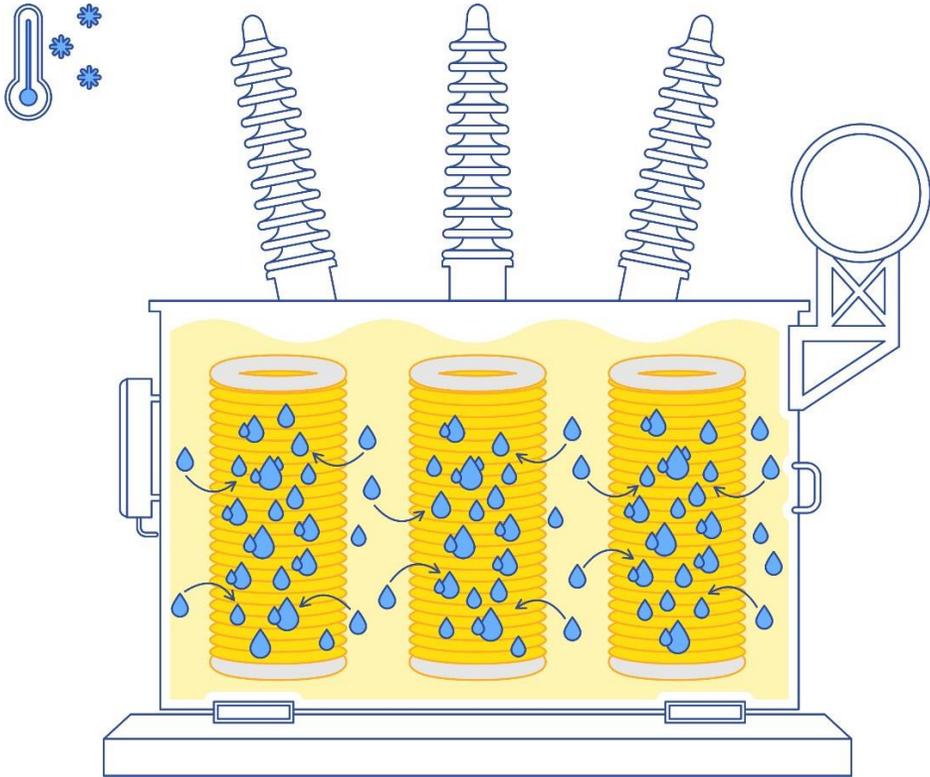
MOISTURE IN TRANSFORMER: WHERE IS IT?



LOAD INCREASE

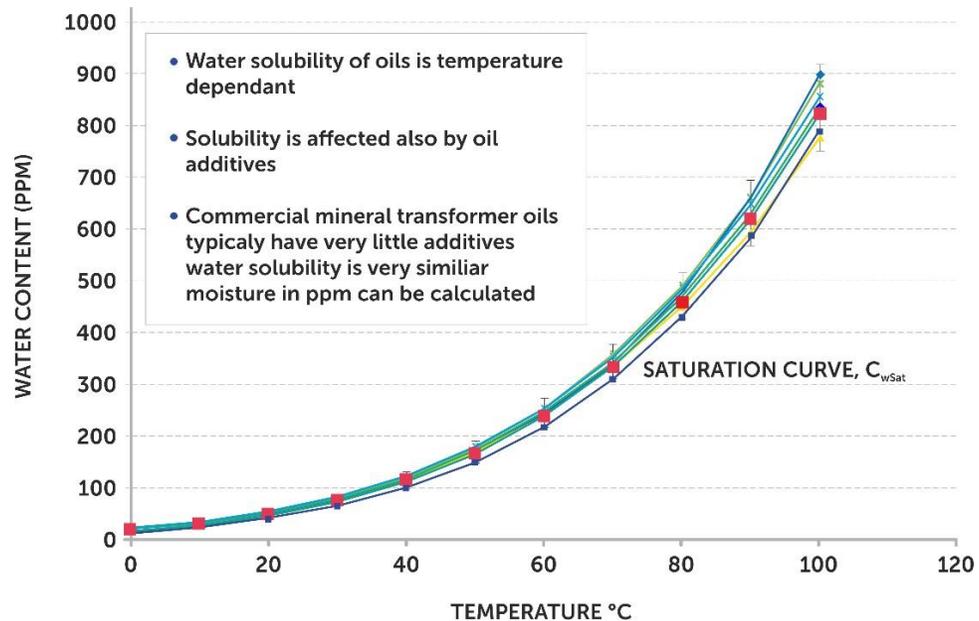


LOAD DECREASE

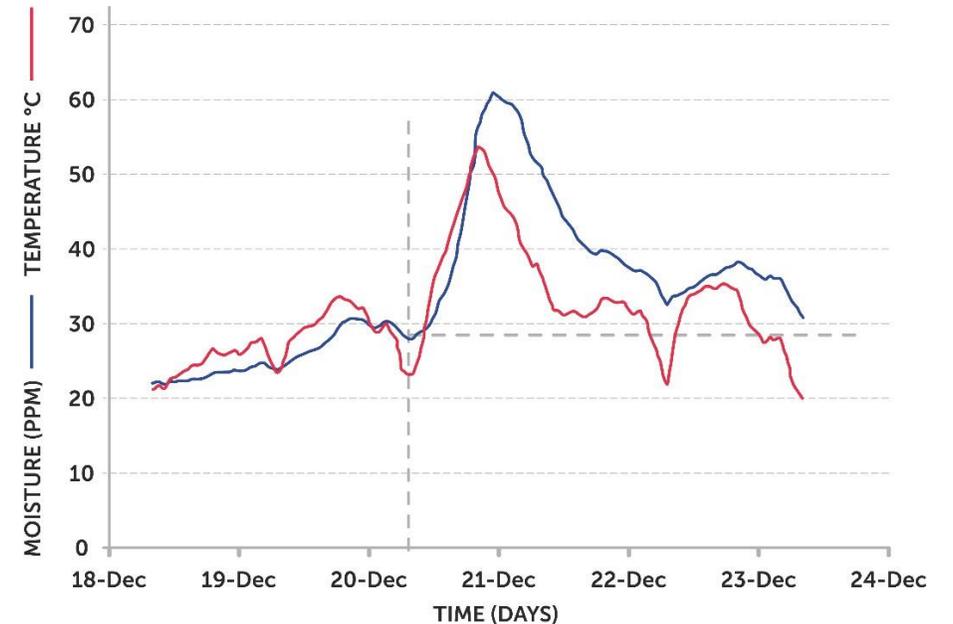


MOISTURE IN TRANSFORMER: WHERE IS IT?

THE MORE THE OIL
IS WARM, THE MORE WATER
IS SOLUBLE IN IT

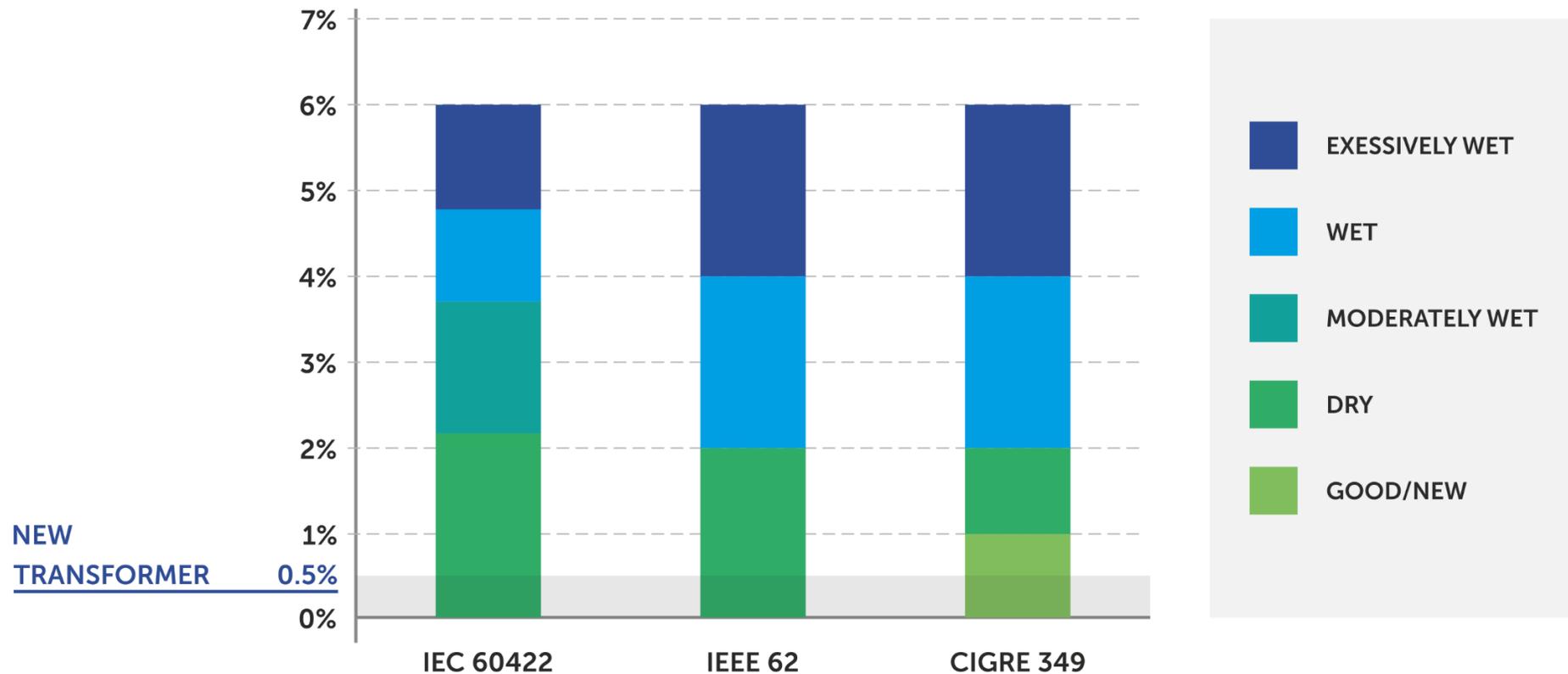


TEMPERATURE AND PPM CURVES
IN A TRANSFORMER
ARE “FOLLOWING” EACH OTHER



MOISTURE IN TRANSFORMER: HOW TO QUANTIFY IT? THE WATER CONTENT

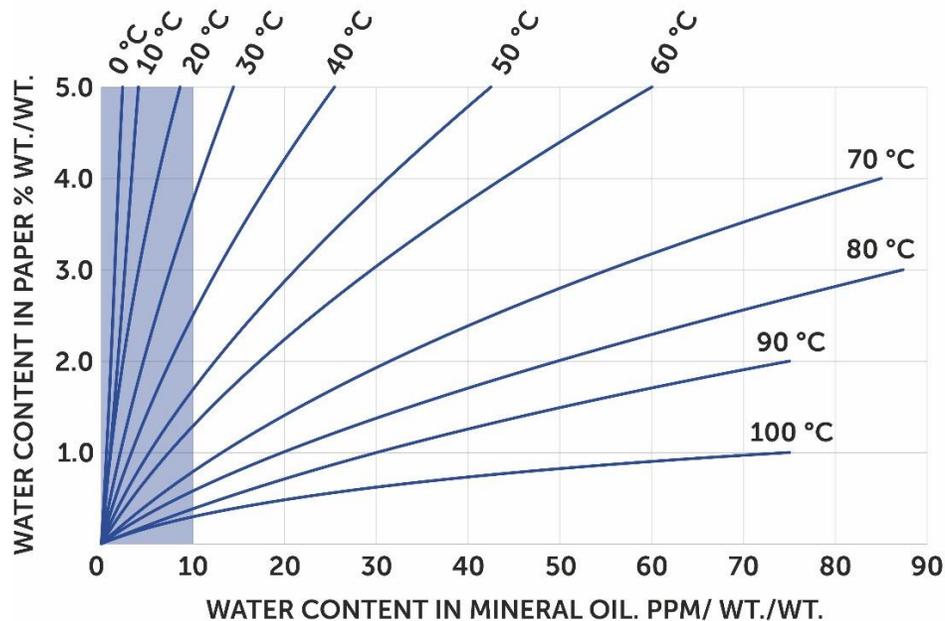
$M_{\text{water}} / M_{\text{insulation paper}}$ in %



MOISTURE IN TRANSFORMER: HOW TO QUANTIFY IT?

1 PPM(V) = 1 part per million (by volume) = 1 liter of water / 1,000,000 liters of oil

- It is crucial to link this value with the oil temperature (see previous slide)
- Then you can use the equilibrium curves to define the water content **IN THE PAPER**



WHAT IS WORST?

25PPM @70°C

or

12PPM @40°C?

MOISTURE IN TRANSFORMER: HOW TO QUANTIFY IT?

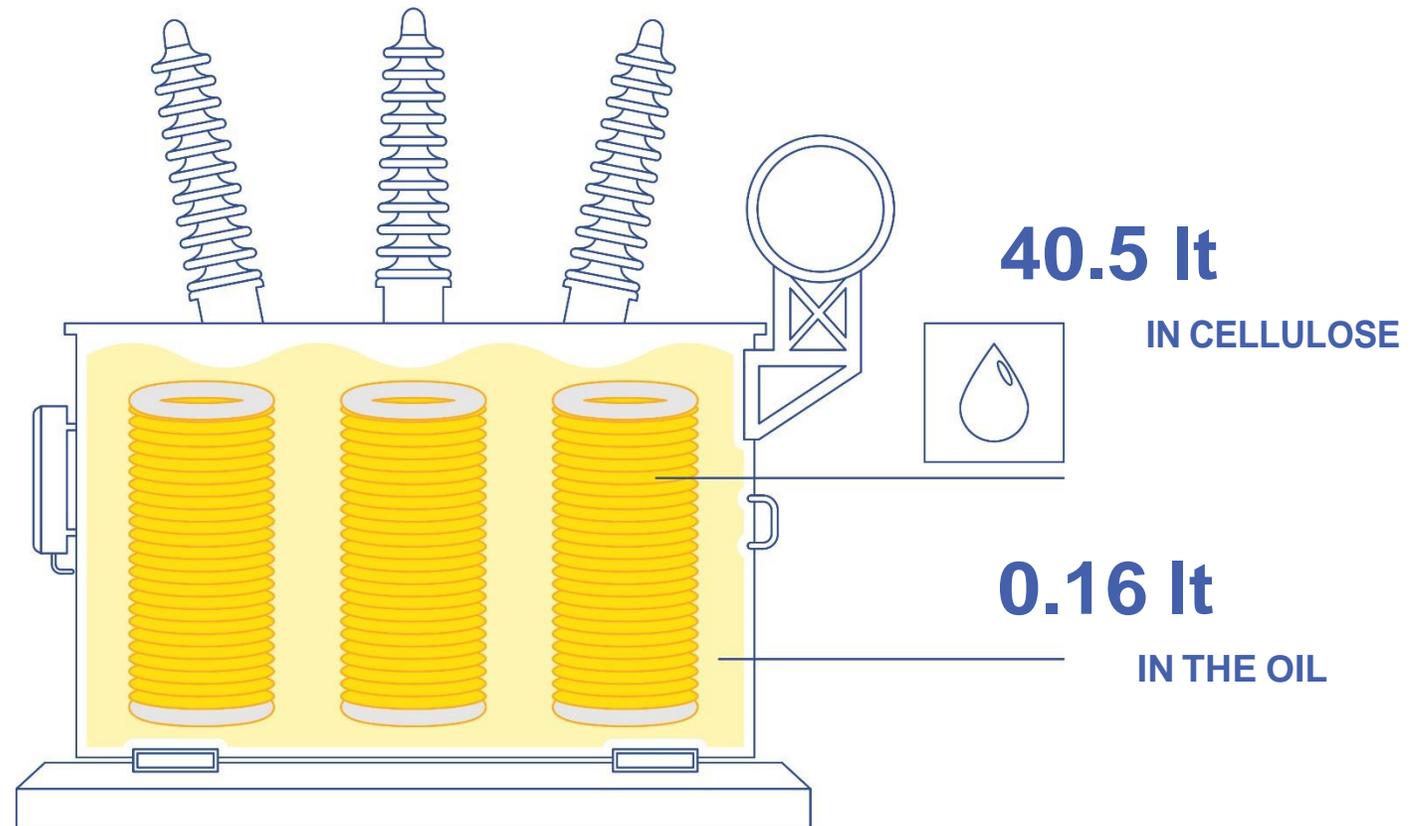
EXAMPLE

36 MVA Transformer

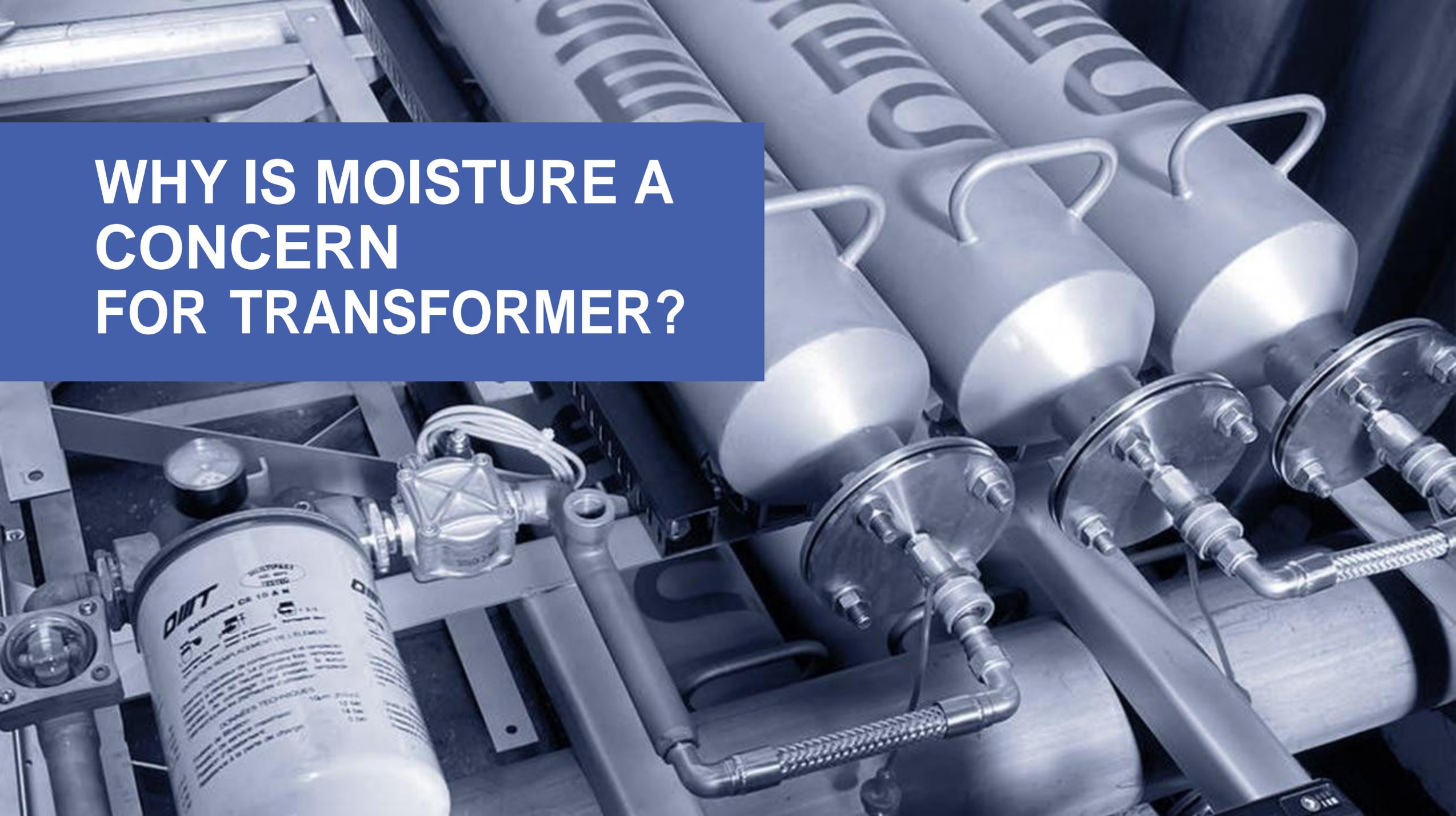
- 15'000 liters of oil (13.2 tons)
- 1.5 ton cellulose insulation
- 12 PPM @40°C average oil temperature

12 PPM of water in oil =
 $0.000012\text{kg} \times 13'200\text{kg} = 0.16\text{kg} =$
0.16 LITER OF WATER

2.7% moisture in cellulose =
 $2.7\% \times 1'500\text{kg} = 40.5\text{kg} =$
40.5 LITERS OF WATER

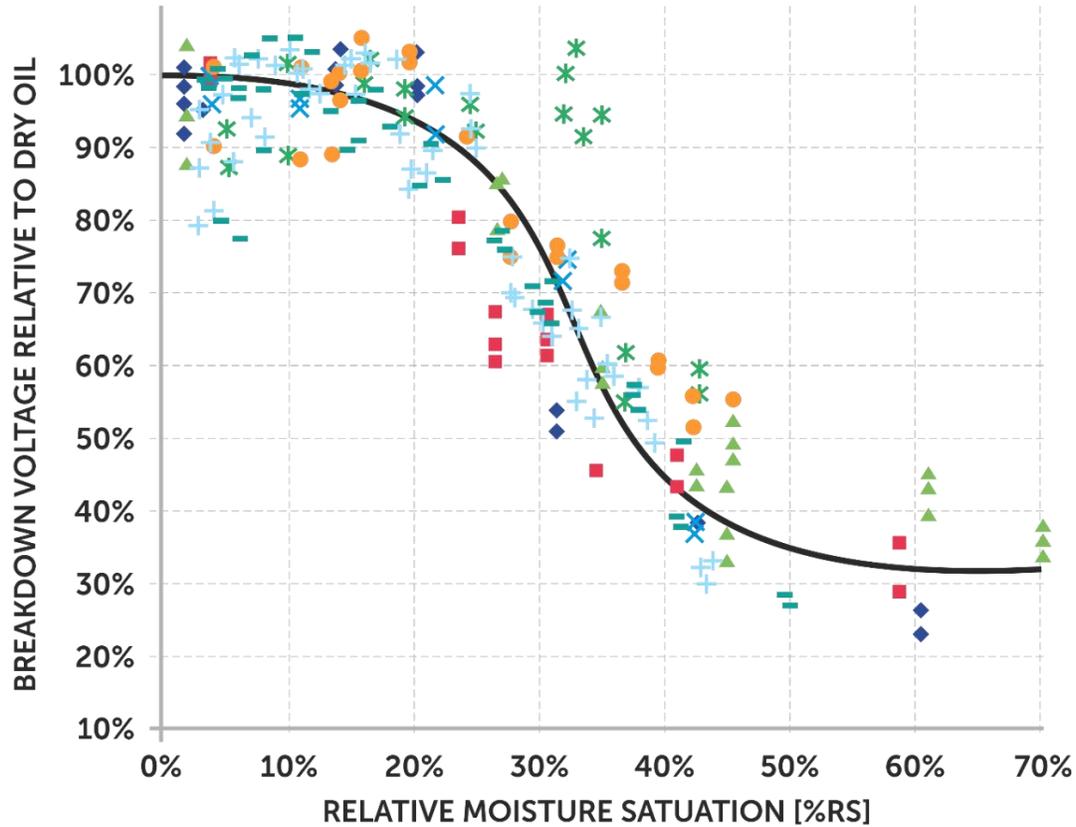


WHY IS MOISTURE A CONCERN FOR TRANSFORMER?



WHY IS MOISTURE A CONCERN? SAFETY

THE BREAKDOWN VOLTAGE DECREASES...



...THE MORE WATER IS CONCENTRATED IN THE OIL

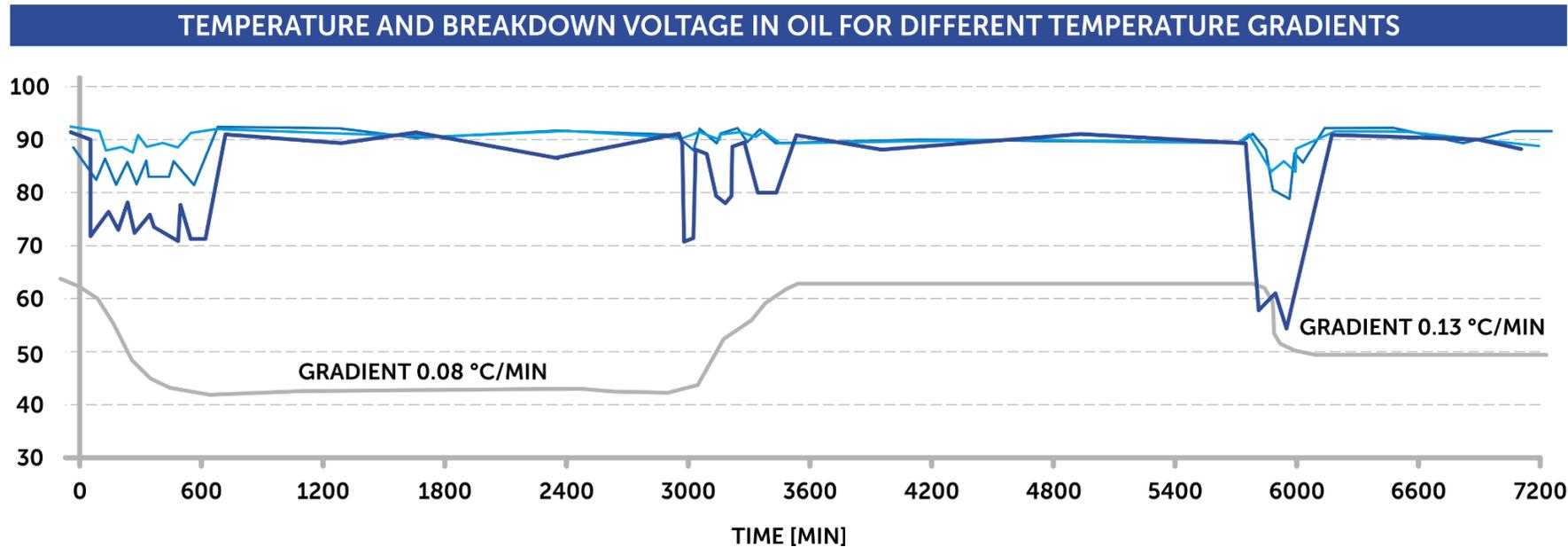


VAISALA

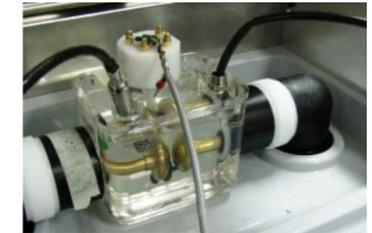
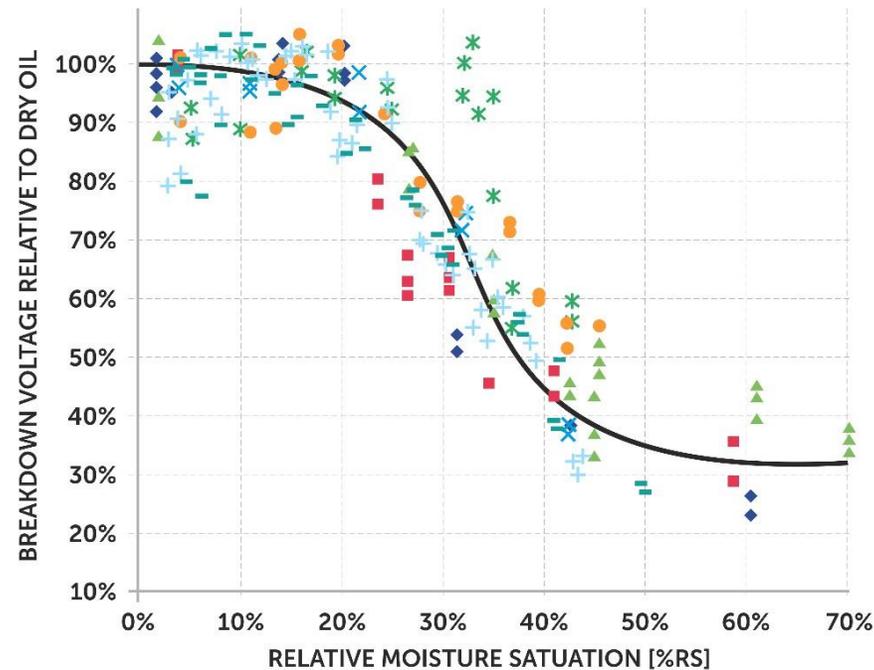
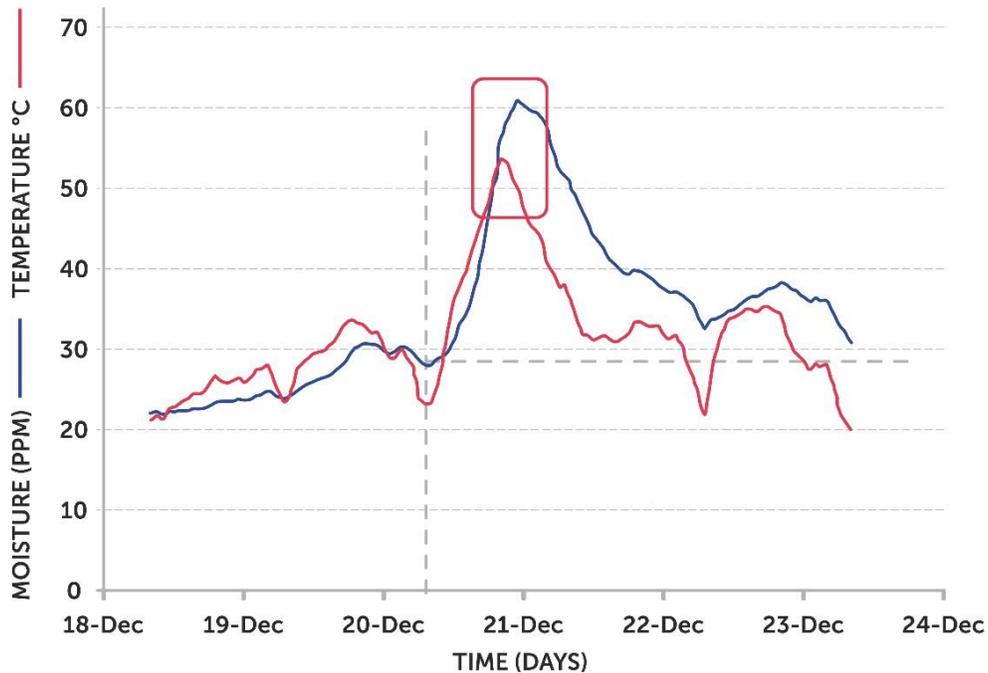
- ◆ SAMPLE 1
- SAMPLE 2
- ▲ SAMPLE 3
- × SAMPLE 4
- * SAMPLE 5
- SAMPLE 6
- + SAMPLE 7
- SAMPLE 8

WHY IS MOISTURE A CONCERN? SAFETY

- Moisture affects the **BREAKDOWN VOLTAGE (BDV)**
- Low breakdown voltage = **RISK OF DAMAGE, FAULTS**, etc.
- Change of temperature = moisture exchanges paper/oil = **DISTURBANCE OF BDV**
- More water in transformer = larger effect on BDV



WHY IS MOISTURE A CONCERN? SAFETY



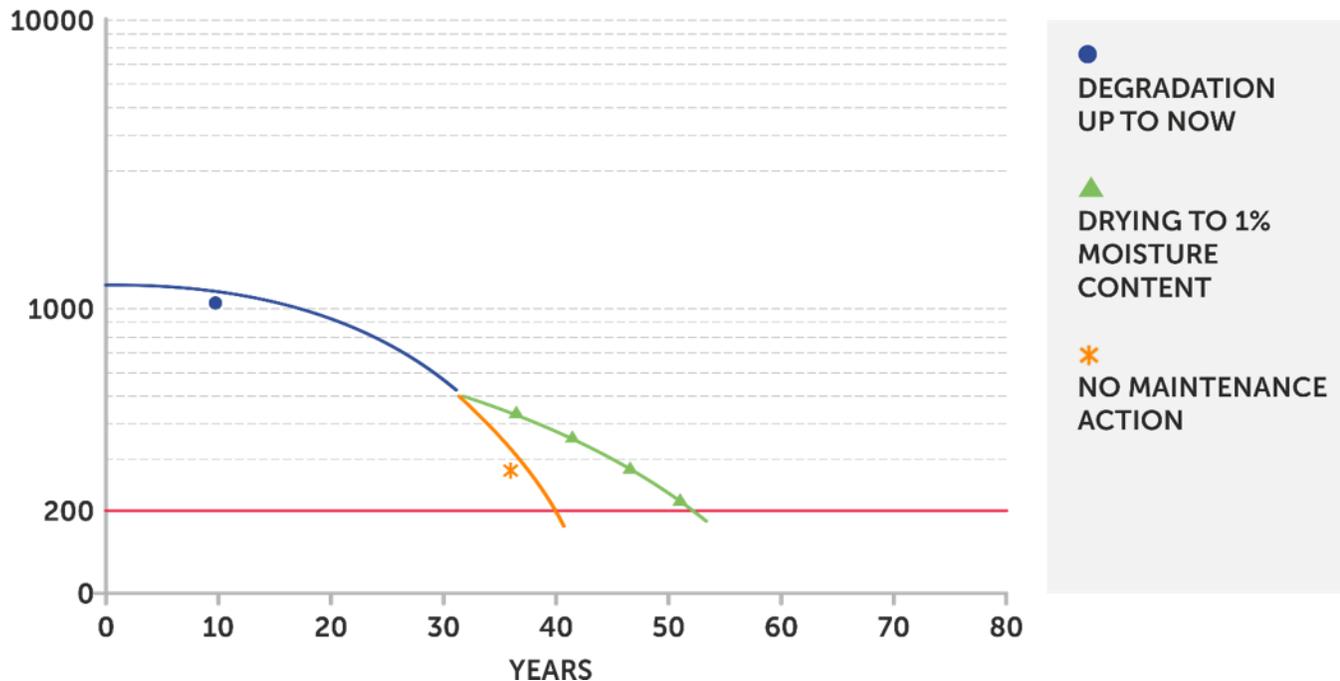
- ◆ SAMPLE 1
- SAMPLE 2
- ▲ SAMPLE 3
- × SAMPLE 4
- * SAMPLE 5
- SAMPLE 6
- + SAMPLE 7
- SAMPLE 8

- When T° rises, PPM rises in the same time (water from paper to oil)
 - When T° decreases, PPM decreases after delay (water from oil to paper)
- WHEN T° DECREASES, RELATIVE MOISTURE SATURATION (%RS) INCREASES FOR A FEW HOURS = LOWER BDV = DANGER**

WHY IS MOISTURE A CONCERN? LIFE EXPECTANCY

- A moisture increase of 1% in the paper is doubling the depolymerisation speed
- **EVERY 1% EXTRA MOISTURE WILL REDUCE RESIDUAL LIFE EXPECTANCY BY A FACTOR 2**

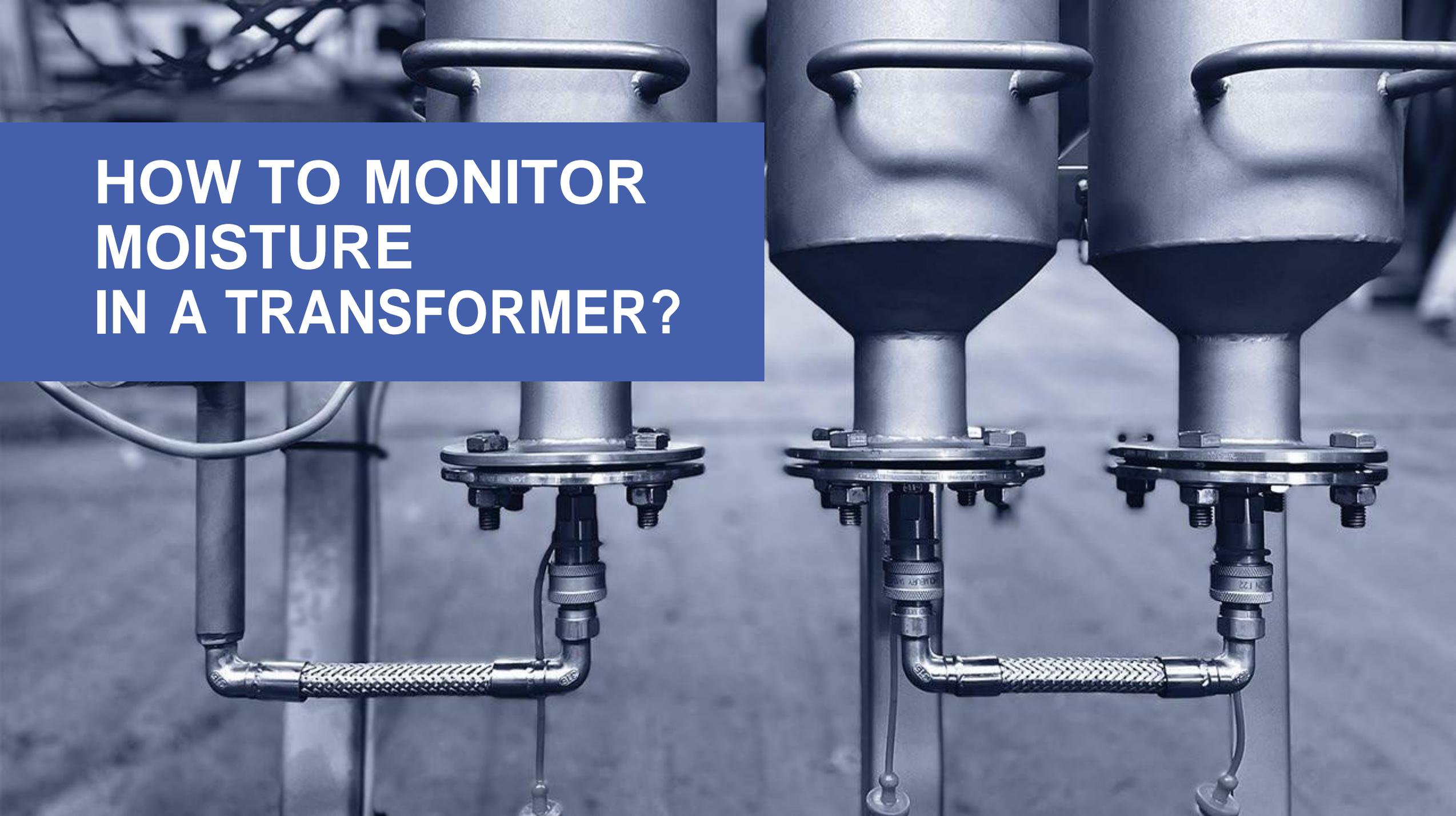
PAPER DEGRADATION SIMULATION WITH STABLE LOAD (TEMPERATURE)



EXAMPLE:

- Transfo 30 yrs old
- 3% moisture
- 10 yrs residual LifeExp
- @1% moisture
- 23 years residual LifeExp

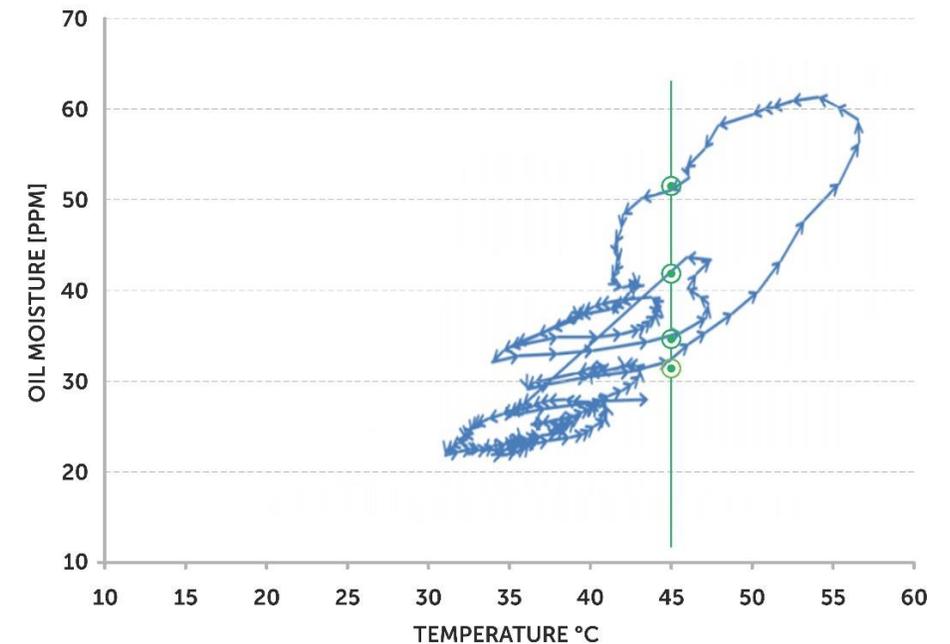
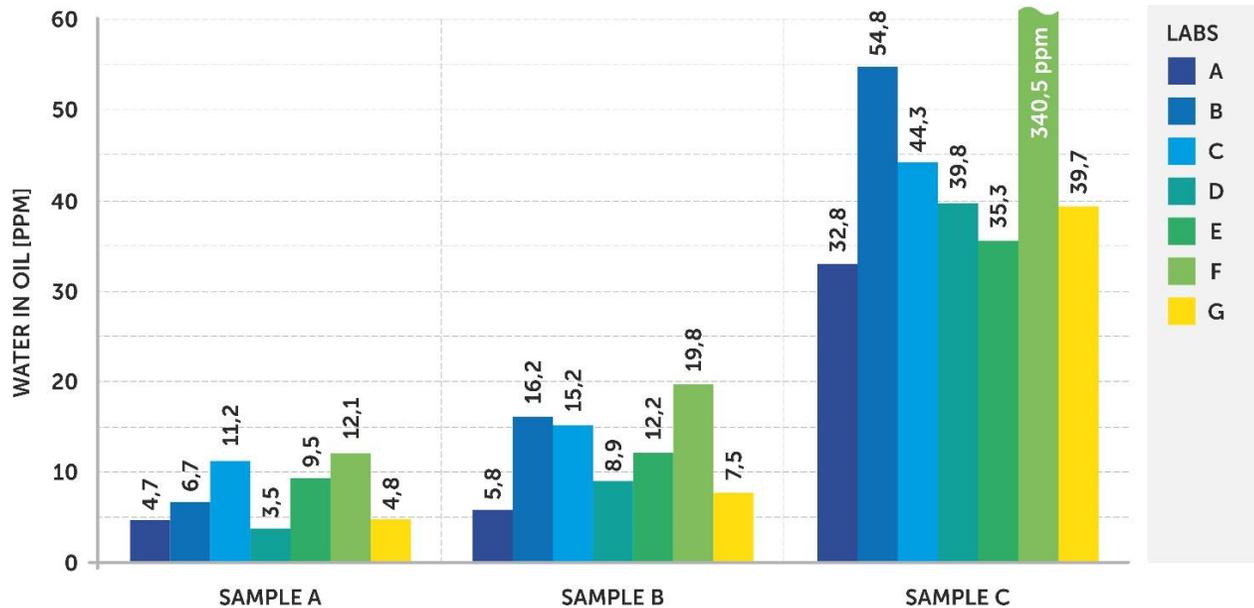
HOW TO MONITOR MOISTURE IN A TRANSFORMER?



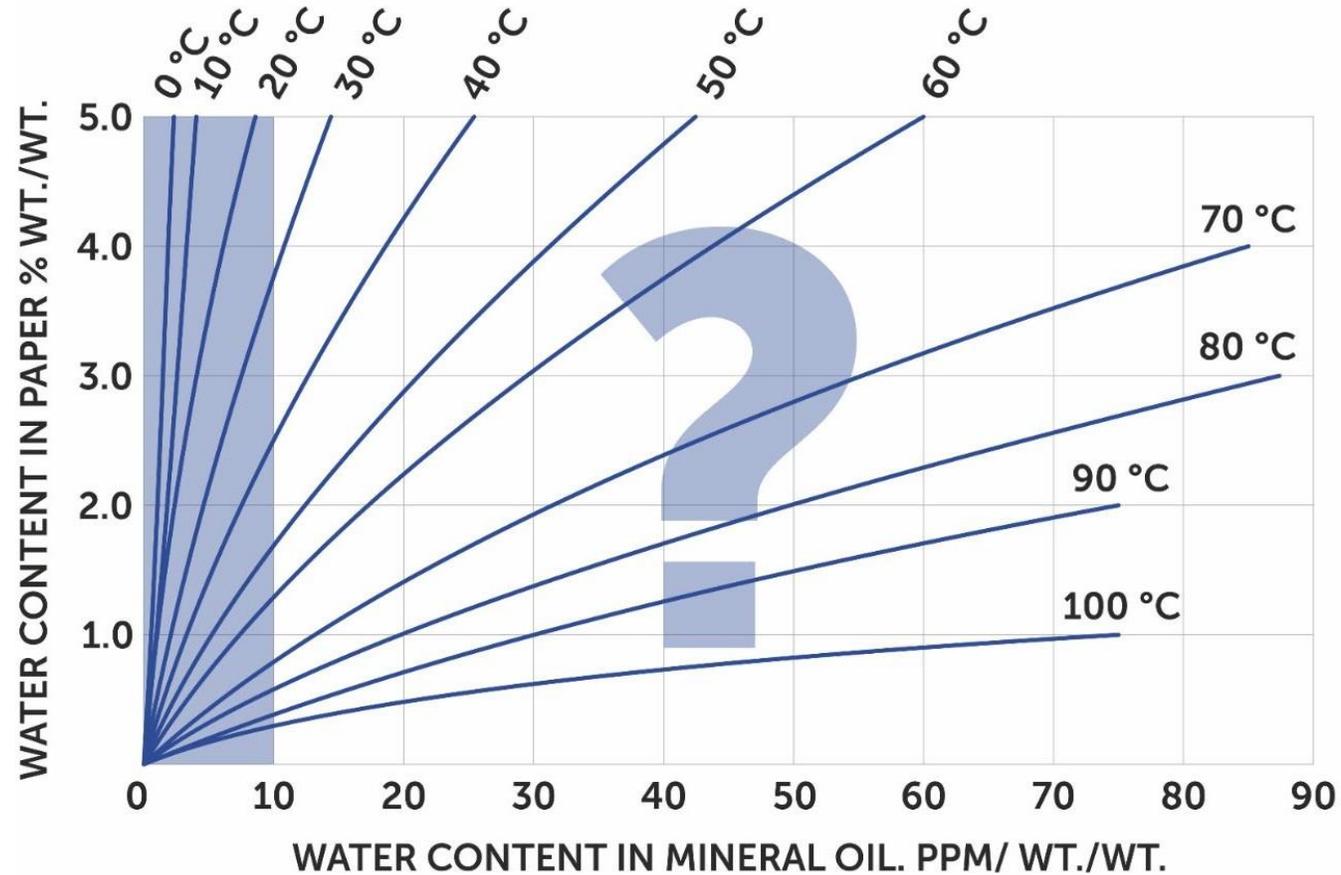
THE ISSUE: MOISTURE HAS A COMPLEX DYNAMIC IN THE TRANSFORMER

LABORATORIES HAVE 2 WEAKNESSES:

- Annual or bi-annual sampling is not sufficient
- Labs also have their error margin at sampling and during the test
- Moisture in oil has a hysteresis
- Here 4 different PPM at the same temperature



THE ISSUE: MOISTURE HAS A COMPLEX DYNAMIC IN THE TRANSFORMER



THE SOLUTION: A CONSTANT MOISTURE MONITORING

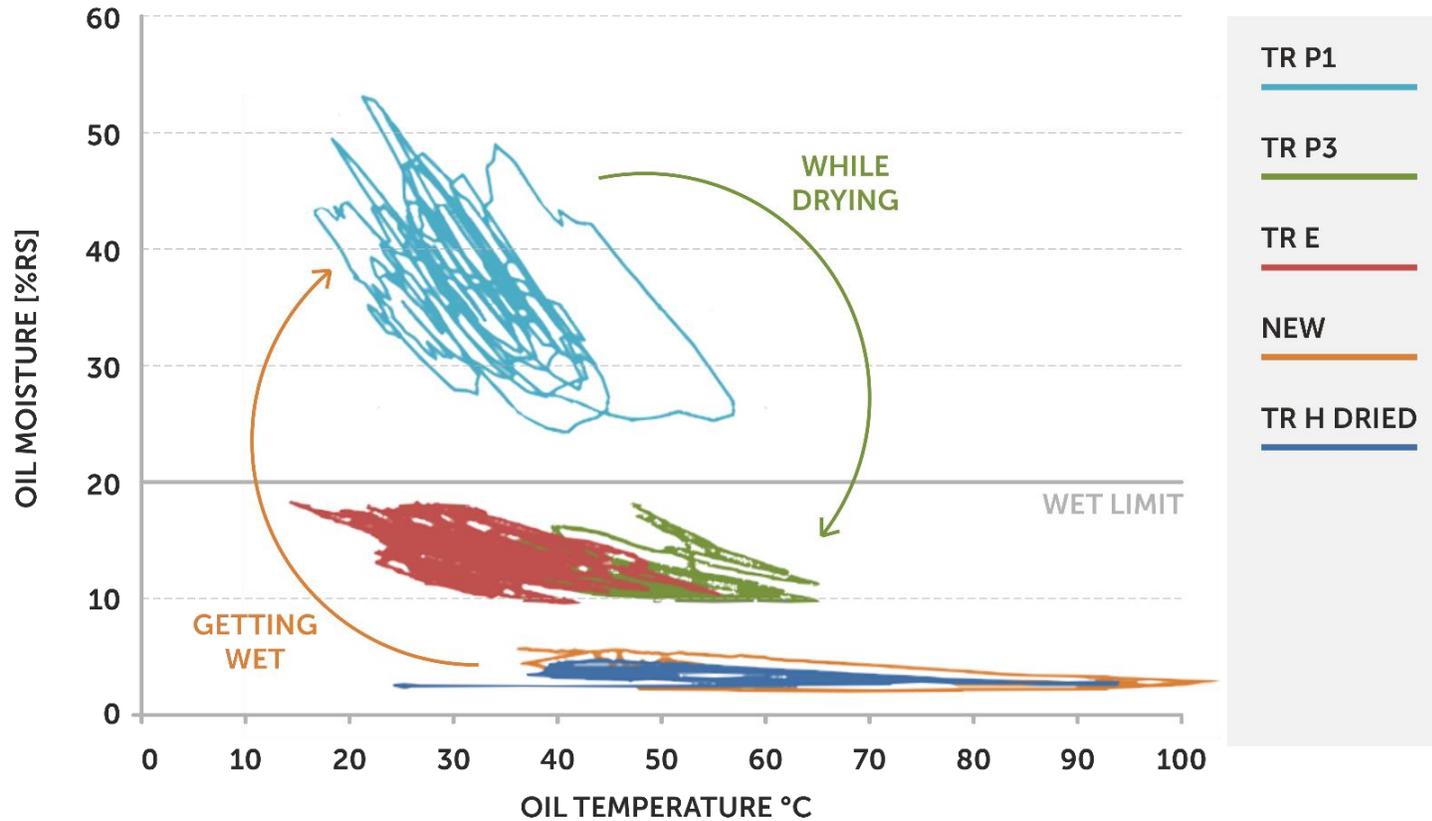


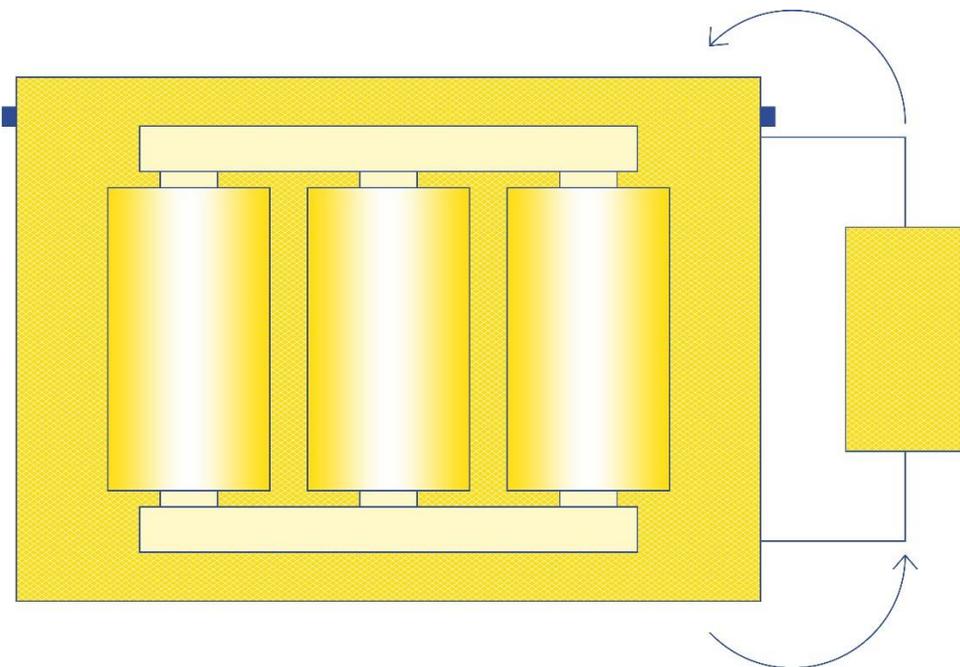
FIGURE 5.29 HYSTERESIS LOOPS PF %RS VS TEMPERATURE IN TRANSFORMETS WITH DIFFERENT MOISTURE

WHAT ARE THE SOLUTIONS TO DRY A POWER TRANSFORMER AND WHEN TO USE THEM?

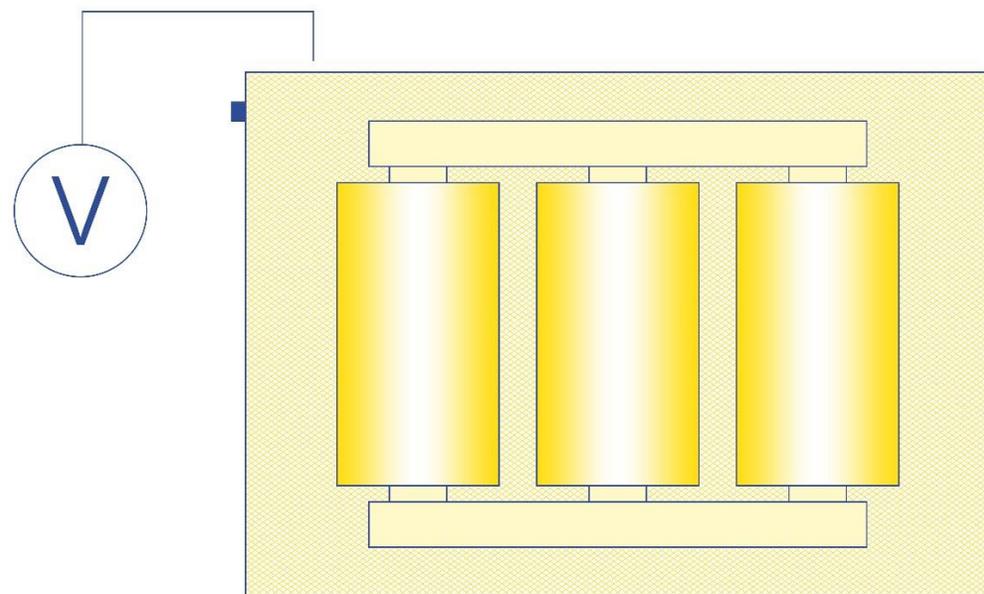


WHAT ARE THE SOLUTIONS TO DRY A POWER TRANSFORMER?

OIL DRYING



VACUUM DRYING



PROCESSES TO DRY A POWER TRANSFORMER: OIL CIRCULATION OR OIL REGENERATION

- **ONLINE OR OFFLINE** process
- Flow: Several thousands of litres per hour



ADVANTAGES

- Low costs
- Simple technique
- Low operative expenditure

DISADVANTAGES

- Very poor paper drying
- Disturbance of oil flow
- Online operation cannot be maintained long (days)
- Disturbance of Dissolved Gases
- Long drying times
- Shorter drying intervals required
- Special equipment required for online process

PROCESSES TO DRY A POWER TRANSFORMER: VACUUM OR LFH DRYING

- **OFF-LINE** process
- Maintenance for a few days



ADVANTAGES

- Most efficient onsite drying method
- Large amount of water removed quickly
- Uniform drying temperatures and drying results
- Ideal for emergency drying of after maintenance

DISADVANTAGES

- Outage required for about a week
- High cost
- Risk for old transformers due to vacuum
- Loss of DGA history
- Experienced operator needed.

PROCESSES TO DRY A POWER TRANSFORMER: ONLINE DRYING SYSTEM

- **ONLINE** installation and process
- Continuous & preventive maintenance (long term)



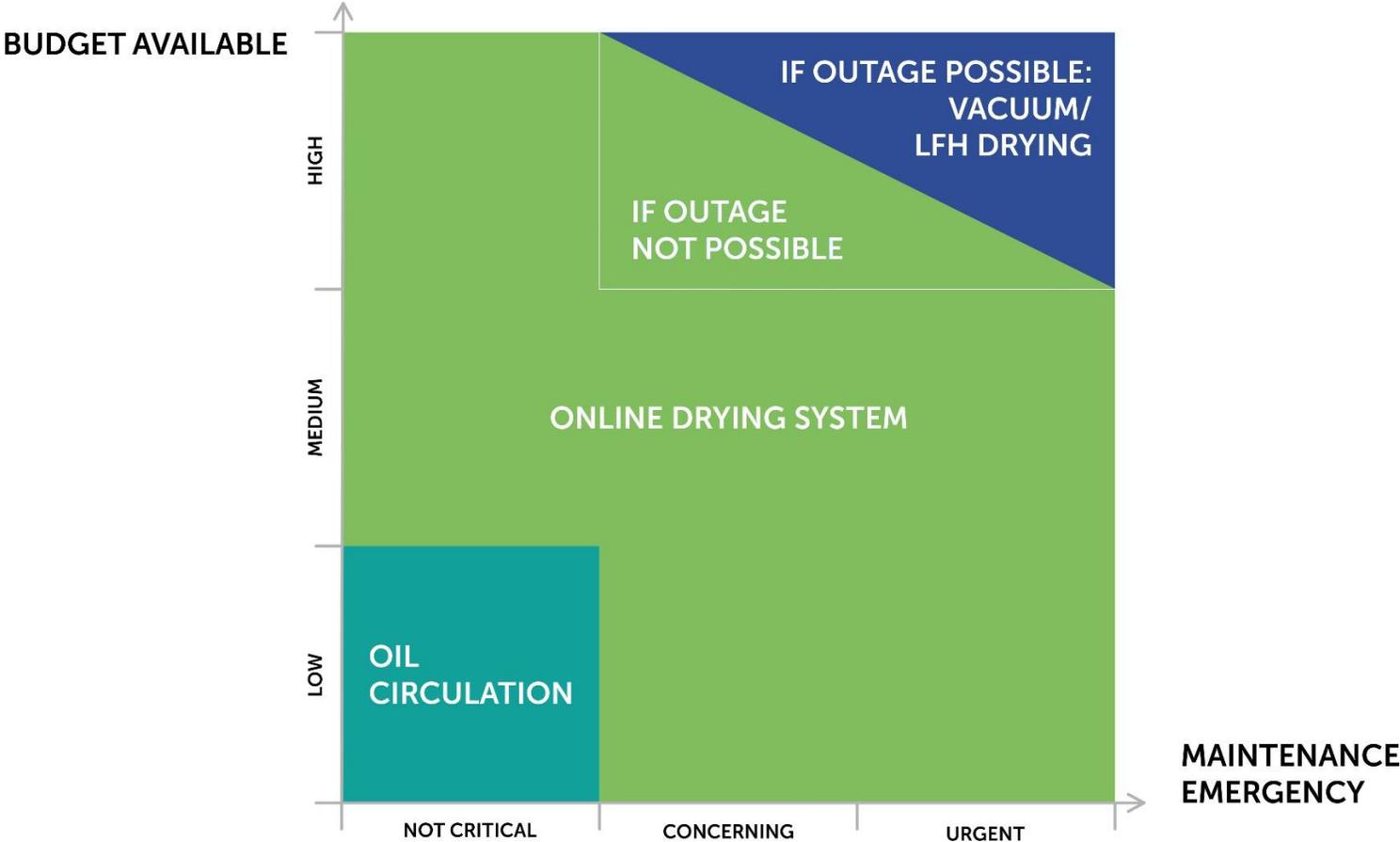
ADVANTAGES

- Low cost
- Good drying efficiency
- Online process – no outage
- No DGA loss
- No operator required
- Long term: safer transformer & longer life expectancy

DISADVANTAGES

- Not ideal for emergency drying
- Cylinders have to be changed once saturated (every 2 yrs in average)

SOLUTIONS TO DRY A POWER TRANSFORMER



WHAT IS TRANSEC ONLINE DRYING SYSTEM?



EXPLANATION MOVIE



PRODUCT MODELS CL UPGRADABLE VERSION

CL1, CL2, CL3 TECHNICAL DATA

Parameter	CL1	CL2	CL3
Recommended transformer size	Above 10 MVA		
Water extraction capacity before cylinder change	3 to 4 litres	6 to 8 litres	10 to 12 litres
Number of cylinders	1	2	3
Oil drying adsorbent	Zeolite with 3 Angstrom bead size		
Monitoring	Available in option		
Size	1940 x 1000 x 300		
Installation weight without MCC	128 kg	164 kg	200 kg
MCC weight	00	AMi	WSi
	0.4 kg	12 kg	20 kg



CL1i WSi



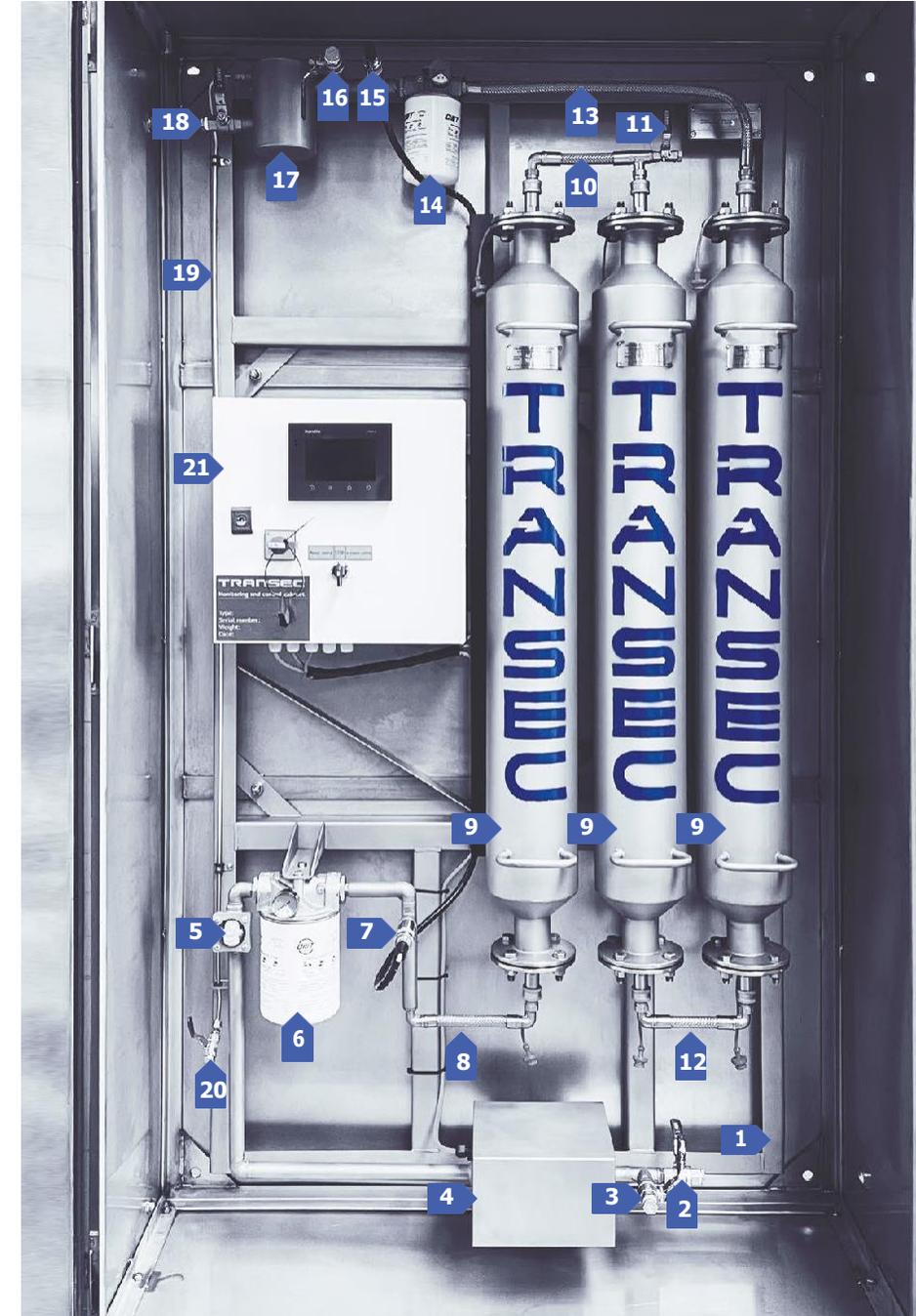
CL2i WSi



CL3i WSi

PRODUCT MODELS CL UPGRADABLE VERSION

- | | |
|---|---|
| 1. Frame | 13. Top interconnection pipeline between cylinder and outlet filter |
| 2. Inlet ball valve | 14. Outlet filter |
| 3. Inlet sampling valve | 15. Outlet moisture and temperature sensor |
| 4. Pump | 16. Outlet sampling valve |
| 5. Flow indicator | 17. Deaerator |
| 6. Inlet filter | 18. Outlet ball valve |
| 7. Inlet moisture and temperature sensor | 19. Bleed pipe |
| 8. Bottom interconnection pipeline between cylinder and sensor/inlet filter | 20. Deaerator air bleed valve |
| 9. Cylinders | 21. AMi monitoring and control cabinet (MCC) |
| 10. Top interconnection pipeline between cylinders | |
| 11. Air bleed valve between cylinders | |
| 12. Bottom interconnection pipeline between cylinders | |



PRODUCT MODELS CL4

THE COMPACT & MOVABLE VERSION

CL4 WSi TECHNICAL DATA



4 CYLINDERS
TO ABSORB
MOISTURE



MOVABLE
VERSION
OF TRANSEC



DAYLIGHT VISIBLE LED
INDICATOR LIGHTS
TO PROVIDE
INFORMATION
ABOUT THE UNIT
STATUS



LIGHTER CYLINDERS –
25 KG EACH SATURATED
WEIGHT



IP 56 ENCLOSED
UNIT

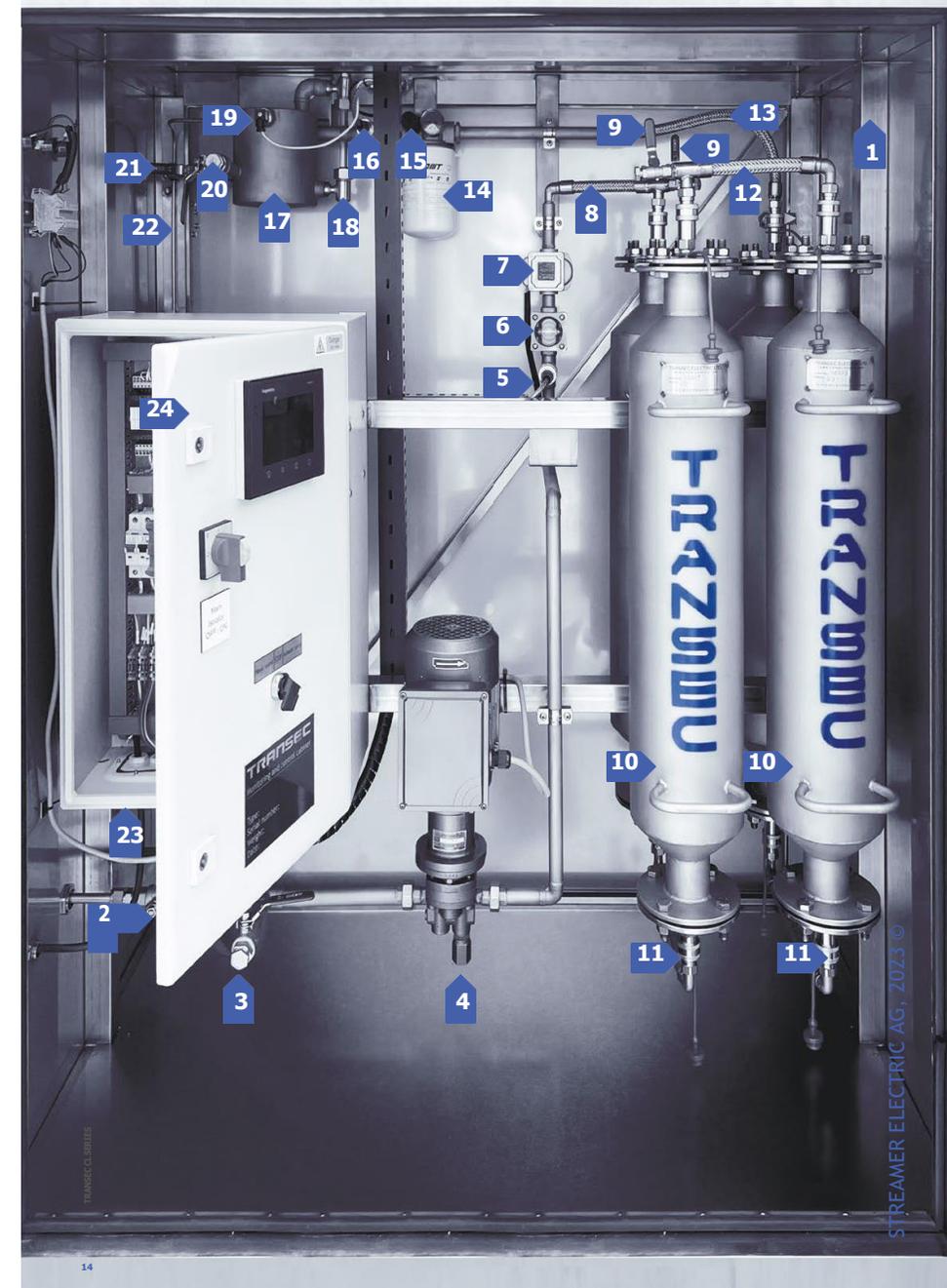
Parameter	CL4
Water extraction capacity before cylinder change	6.5 litres
Number of cylinders	4
Oil drying adsorbent	Zeolite with 3 Angstrom bead size
Monitoring	WSi only
Size	1443 x 1200 x 747
Installation weight	350 kg



PRODUCT MODELS CL4

THE COMPACT & MOVABLE VERSION

- | | |
|---|--|
| 1. External enclosure | 13. Outlet filter |
| 2. Inlet ball valve | 14. Particle filter sensor |
| 3. Inlet sampling valve | 15. Outlet moisture and temperature sensor |
| 4. Pump | 16. Deaerator |
| 5. Inlet moisture and temperature sensor | 17. Glass gauge |
| 6. Flow indicator | 18. Float switch |
| 7. Flow meter | 19. Outlet sampling valve |
| 8. Top interconnection pipeline between cylinder and sensor | 20. Outlet ball valve |
| 9. Air bleed valve on the first cylinder and air bleed valve between second and third cylinders | 21. Bleed pipe |
| 10. Cylinders | 22. Deaerator air bleed valve |
| 11. Bottom interconnection pipelines between cylinders | 23. WSi monitoring and control cabinet (MCC) |
| 13. Top interconnection pipeline between cylinders | |
| 14. Top interconnection pipeline between cylinder and outlet filter | |



2 DIFFERENT MONITORING CABINETS ARE AVAILABLE



AMi

AMi for a complete monitoring of the TRANSEC system & Moisture situation of the transformer



WSi

WSi for advanced moisture analytics and product automation

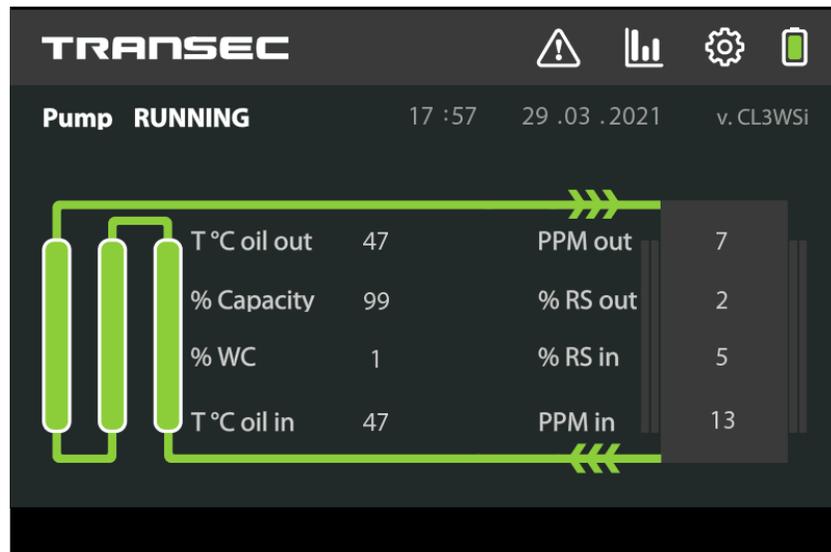
2 DIFFERENT MONITORING CABINETS ARE AVAILABLE



	AMi	WSi
Local display	Oil temperature IN&OUT, PPM Moisture IN&OUT, Relative Saturation in, Pump and sensor status or alarm, Settings, Reports, Trends	Oil temperature IN&OUT, PPM Moisture IN&OUT, Relative Saturation IN&OUT, Water content in paper, Pump and sensor status or alarm, Settings, Reports, trends, Cylinder saturation level, Total water volume extracted
Data logging	Temperature IN&OUT, PPM IN&OUT, Relative saturation IN, Alarms	Temperature IN&OUT, PPM IN&OUT, Relative saturation IN&OUT, Water content in paper, Cylinder Saturation, Alarms
Alarms	<ul style="list-style-type: none"> • SensorInDown • SensorOutDown • Overheat • %RS Alarm • AlarmReset • %CapacityAlarm • T°C IN • T°C OUT <ul style="list-style-type: none"> • PPM IN • PPM OUT 	<ul style="list-style-type: none"> • Pump status • SensorInDown • SensorOutDown • OverheatCab • LowFlow - Oil flow rate, l/h • Leakage • OverheatOil • Paper overdry • Alarm reset <ul style="list-style-type: none"> • FreezeOil - Oil temperature below the setpoint • %CapacityAlarm • %RS Alarm • T°C IN • T°C OUT • PPM IN • PPM OUT • Water Content - %WC alarm setpoint
Cylinders saturation	Saturation estimated based on the PPM IN&OUT difference	Calculated based on PPM and oil flow
Sensors	2x high accuracy moisture and temperature sensors	
Remote control	Alarm settings	Alarm settings, Pump stop & restart conditions
Communication	Via 3G/4G network or Ethernet: TCP/IP (VNC, HTTP, FTP/SFTP, MODBUS) USB stick	

2 DIFFERENT MONITORING CABINETS ARE AVAILABLE

MONITORING CABINET WSi



- Main screen
- The water content in paper and the cylinder saturation is calculated

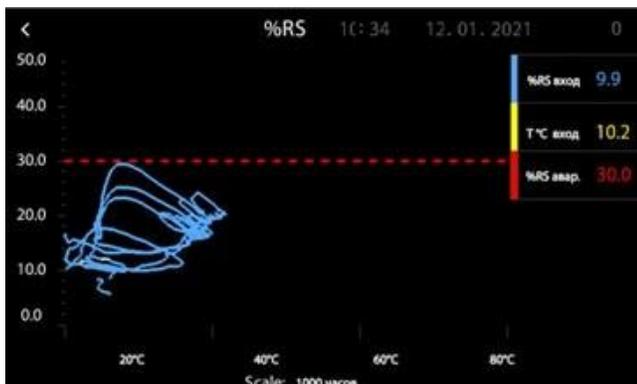
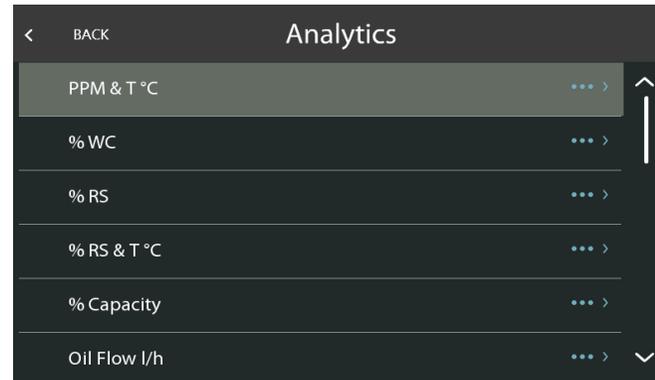
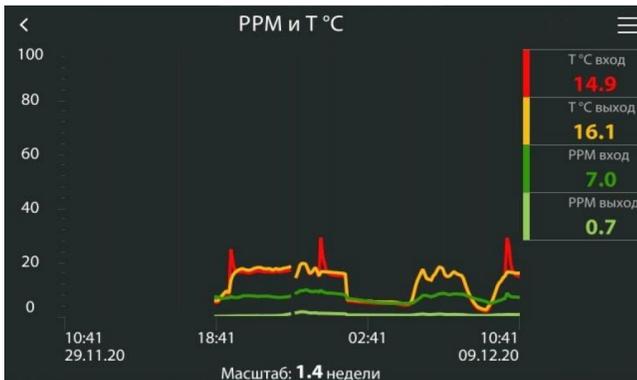


- It is also possible to see how much water has been extracted from the unit since the start
- And the system estimate the next date of cylinder swap depending of the speed of water extraction

2 DIFFERENT MONITORING CABINETS ARE AVAILABLE



MONITORING CABINET WSi



- Much more graphs are available on this model as the moisture relative saturation hysteresis are recommended by CIGRE

Settings menu

% RS alarm	20
% WC alarm	6
% WC overdry alarm	1
% WC overdry pump shutdown	No
% WC overdry pump shutdown time, hr	24
% Capacity alarm	10

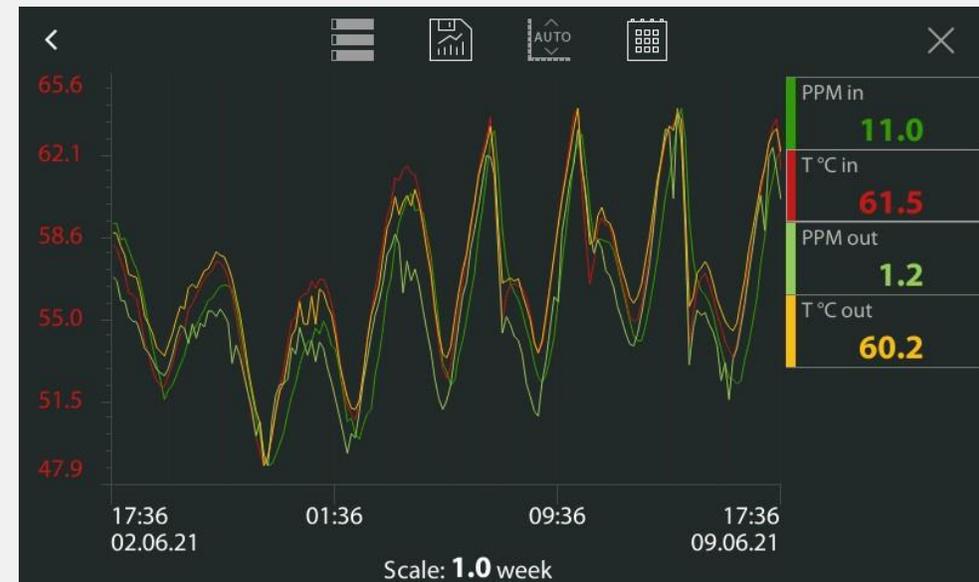
- Many alarms can be set and it is also possible to stop or start the pump accordingly

2 DIFFERENT MONITORING CABINETS ARE AVAILABLE

MONITORING CABINET AMi



- Main screen



- Graphs of moisture level & temperature are available

OPTIONS AVAILABLE WITH TRANSEC



EXTERNAL ENCLOSURE

The optional enclosure for the TRANSEC unit will protect the HMI and the hardware from rain, dust, heat, direct sunlight and UV. The enclosure is made of stainless steel.



LEAK DETECTION TRAY

The accessory (only available on the WSi version) will detect any oil leak within the TRANSEC system and will provide the alarm accordingly. It is, of course, strongly advised to combine this option with an external enclosure (to protect from rain) and a solenoid inflow valve in order to block the oil circulation in case of leakage.



INFLOW CONTROLLABLE SOLENOID VALVE

This valve can be set remotely to operate and block the oil flow in case of leakage or rising temperature.



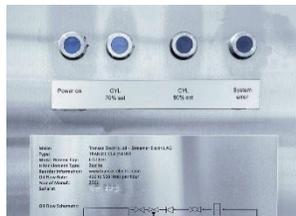
GATEWAY FOR IEC 61850 PROTOCOL COMMUNICATION

Monitoring and Control cabinet can be equipped with a gateway that allows to use fiber connectors for the Ethernet port.



DEAERATOR GLASS GAUGE AND SWITCH

To be sure that no air is entering the transformer, a deaerator is placed at the end of the TRANSEC. For additional protection, it is possible to see the level of air in the deaerator with an optional glass gauge and to have a switch that will signal an alarm if the level of air reaches a dangerous level..

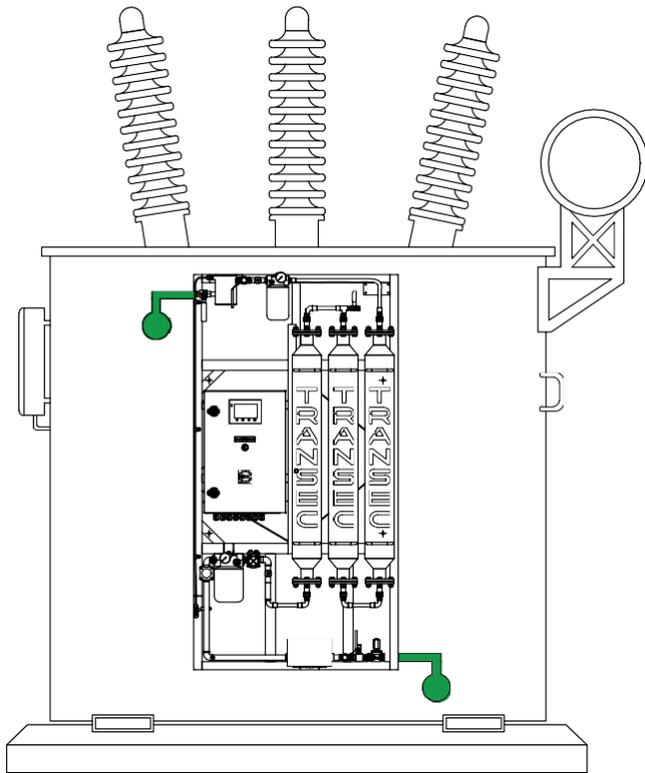


LED INDICATORS

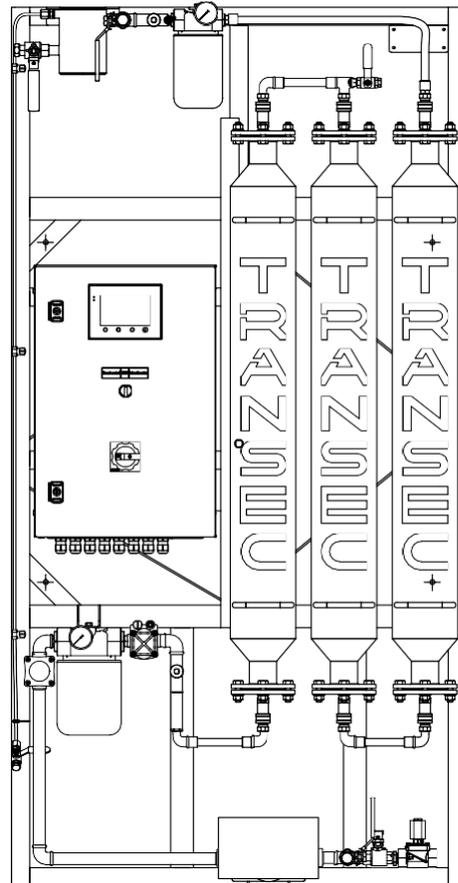
They will allow you to observe:

- Power on — unit is working
- CYL 70% sat — cylinders have been saturated up to 70%
- CYL 90% sat — cylinders have been saturated up to 90%
- System error — there is a system error that you will see on the HMI screen.

INSTALLATION

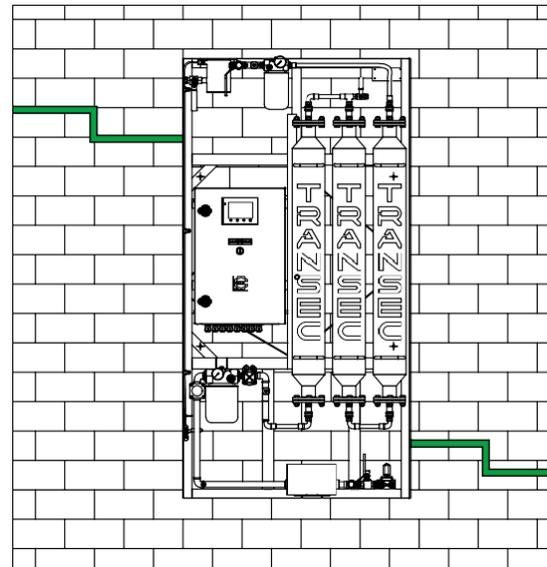


ON TRANSFORMER



STAINLESS STEEL PIPES

FLEXIBLE PIPES



ON THE WALL



Directly on the TRANSFORMER,
a WALL or as a STAND ALONE unit

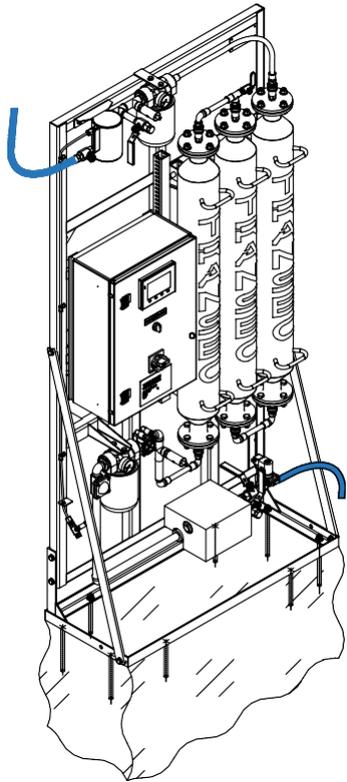


Connection to top and bottom
valves with STAINLESS STEEL
or FLEXIBLE pipes

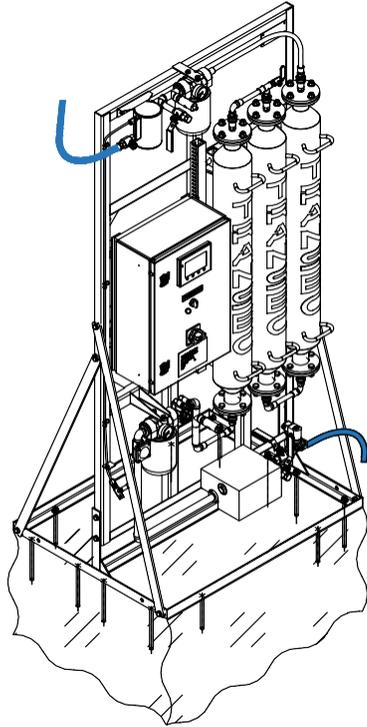


Installation possible while
transformer is live ca 4 HOURS

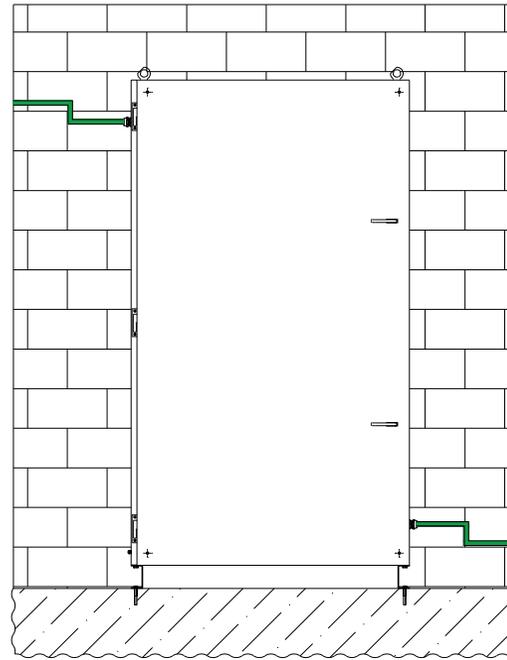
INSTALLATION



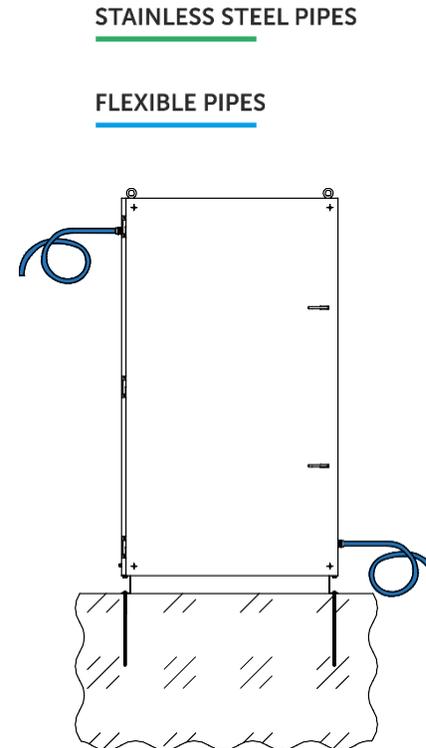
FLOOR MOUNTED
STAND VERSION 1



FLOOR MOUNTED
STAND VERSION 2



ENCLOSED UNIT
ON THE WALL



STAND ALONE
ENCLOSED UNIT



Directly on the TRANSFORMER,
a WALL or as a STAND ALONE unit



Connection to top and bottom
valves with STAINLESS STEEL
or FLEXIBLE pipes



Installation possible while
transformer is live ca 4 HOURS

CYLINDER REGENERATION



- Maximum extraction → capacity 4 liters per cylinder
- Quick replacement → 10 mins with 2 individuals per cylinder
- Local stocks are available.
Only a service fee will be charged for the cylinder replacement

How long does it take to 3 cylinders to get saturated?

- **WET TRANSFORMER**
6 months
- **NEW TRANSFORMER**
5 years
- **AVERAGE DURATION**
2 years

TRANSEC REGENERATION REPORT SHEET

Project Ref: 4396/02 Client: EDF ENERGY NUCLEAR GENERATION LTD

Site: DUNGNESS B POWER STN Transformer ID.: UNIT TX T 22 A

Date removed from transformer site: Mar-12

Date processed on Regeneration Plant: 14.03.12 Plant Operator: C. PILLING

Cylinder Serial Nos:	843	844	845
1 Initial weight on receipt. (Full with 'dirty, wet'oil) Kg	41.3	41.2	41.0
2 Drained weight before recycling (i.e., drained of 'free'oil) Kg	35.3	35.4	35.2
3 Dry weight after recycling (i.e., 'cleaned' cylinders, no fluid contents) Kg	29.6	29.8	29.4
4 Final weight, after refilling with clean, 'dry' oil (for putting back into service) Kg	37.6	37.4	37.4

5 Calculations	6	5.8	5.80
Drained fluid (1. - 2.) Kg			
Fluid removed by Regeneration (2. - 3.) Kg	5.725	5.55	5.78
Oil volume refilled. ({ 4. - 3. } / 0.88) Litres.	9.09	8.64	9.09
Water removed from transformer (1 - 4) Kg = Litres	3.73	3.75	3.58

Notes.

General:

Of the 'Fluid removed', (2. - 3. , above) between approx. 3.0 and 5.5 litres can be attributed to oil remaining after the first Draining. It depends on the condition of the oil, especially entrained fibres, etc. and, in general, the higher the fibre content, the larger the volume (therefore weight) of oil remaining on the adsorbent beads within the cylinders after draining.

Specific:

The total of moisture adsorbed, at just over 11 kg (= litres) is again above the theoretical capacity of a set of cylinders- very similar to Transformer T 22 B and similar interest in future performance will be followed up.

EXAMPLE OF TRANSEC INSTALLATION

- SUBSTATION GANDARIA JAKARTA - INDONESIA
- 30MVA - 69kV/20kV - OLTC
- REVIEW FROM JULY 2016 TO JULY 2017



SUBSTATION GANDARIA JAKARTA – INDONESIA



INSTALLATION

- 30MVA – 69kV/20kV – OLTC
- Review from July 2016 to July 2017



SUBSTATION GANDARIA JAKARTA – INDONESIA



TRANSFORMER OUTPUT & INPUT

• 30MVA – 69kV/20kV – OLTC

• Review from July 2016 to July 2017



SUBSTATION GANDARIA JAKARTA – INDONESIA



INSTALLATION

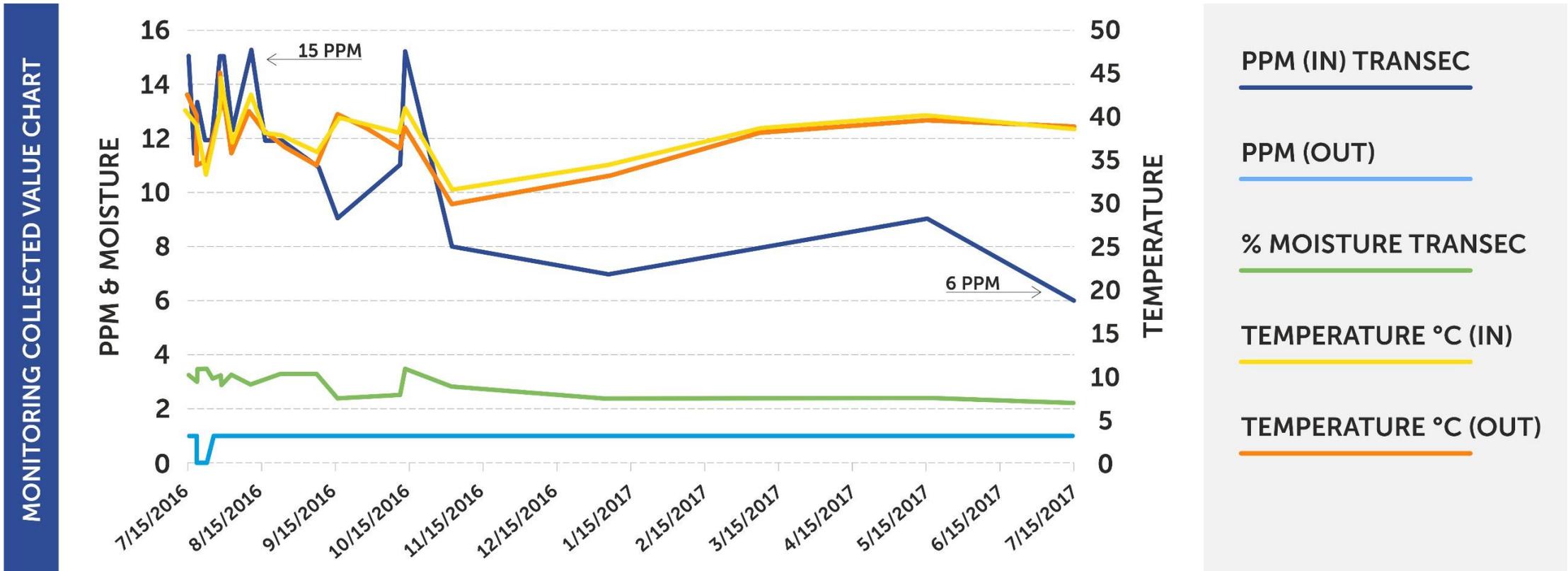
- 30MVA – 69kV/20kV – OLTC
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SUBSTATION GANDARIA JAKARTA – INDONESIA



- 30MVA – 69kV/20kV – OLTC
- Review from July 2016 to July 2017

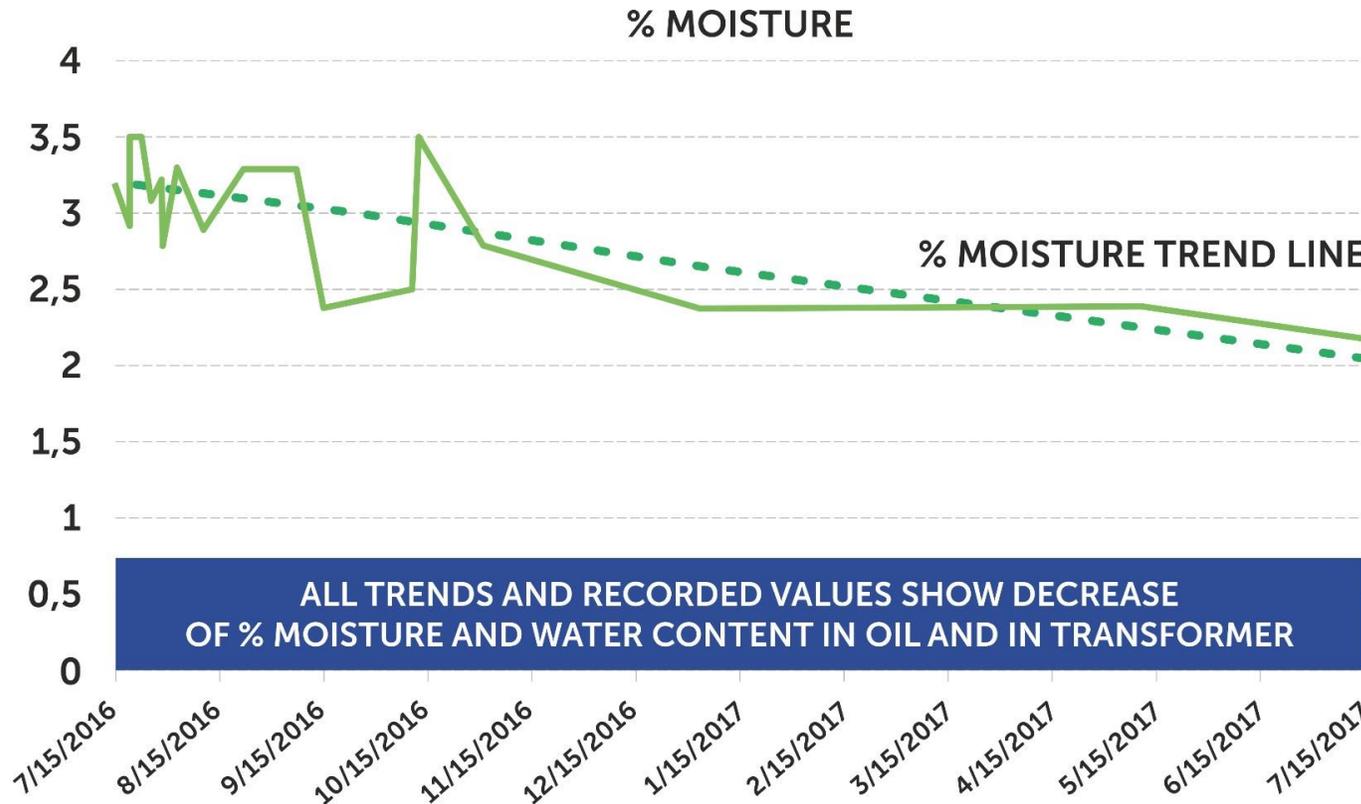


SUBSTATION GANDARIA JAKARTA – INDONESIA



- 30MVA – 69kV/20kV – OLTC
- Review from July 2016 to July 2017

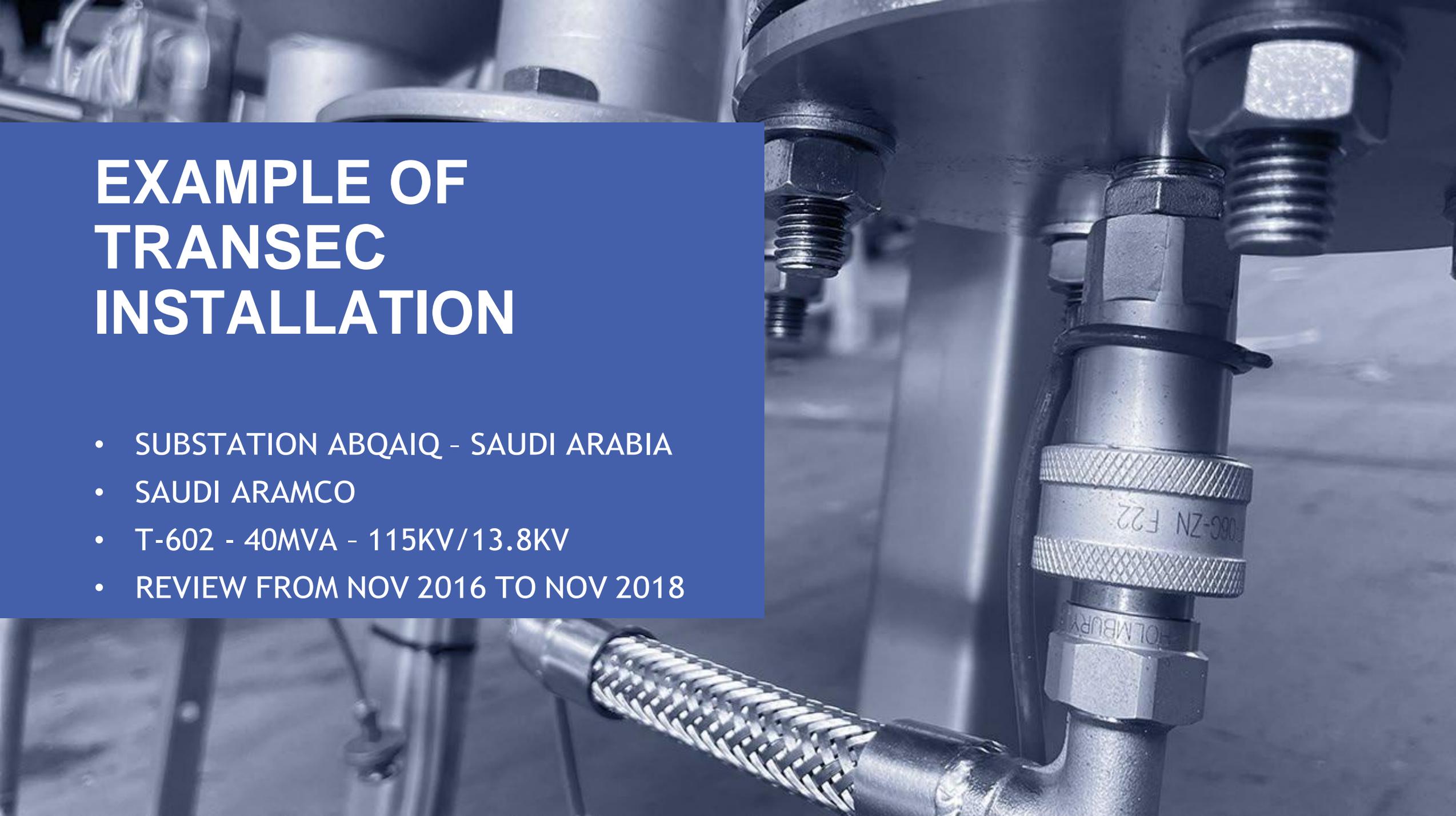
3.2 %



2.2 %

EXAMPLE OF TRANSEC INSTALLATION

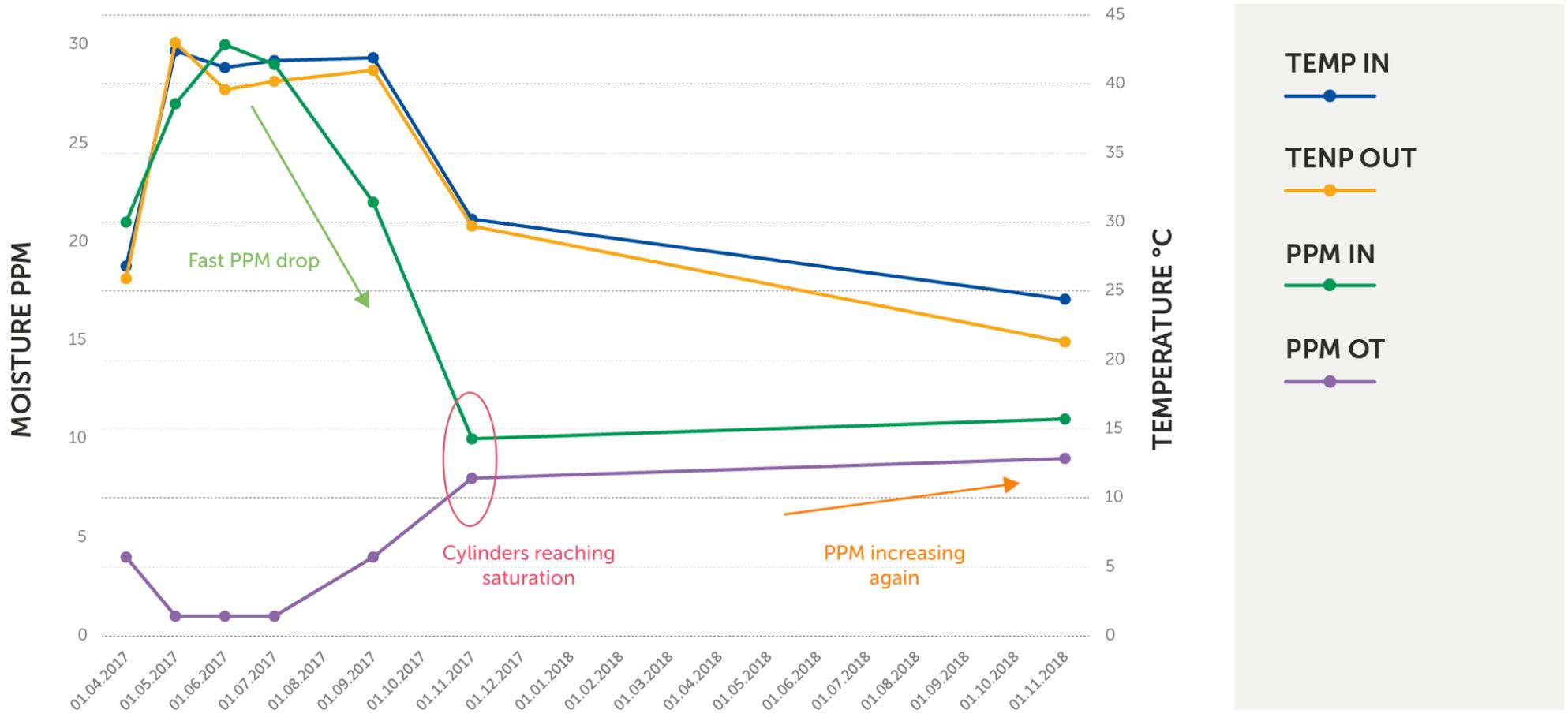
- SUBSTATION ABQAIQ - SAUDI ARABIA
- SAUDI ARAMCO
- T-602 - 40MVA - 115KV/13.8KV
- REVIEW FROM NOV 2016 TO NOV 2018



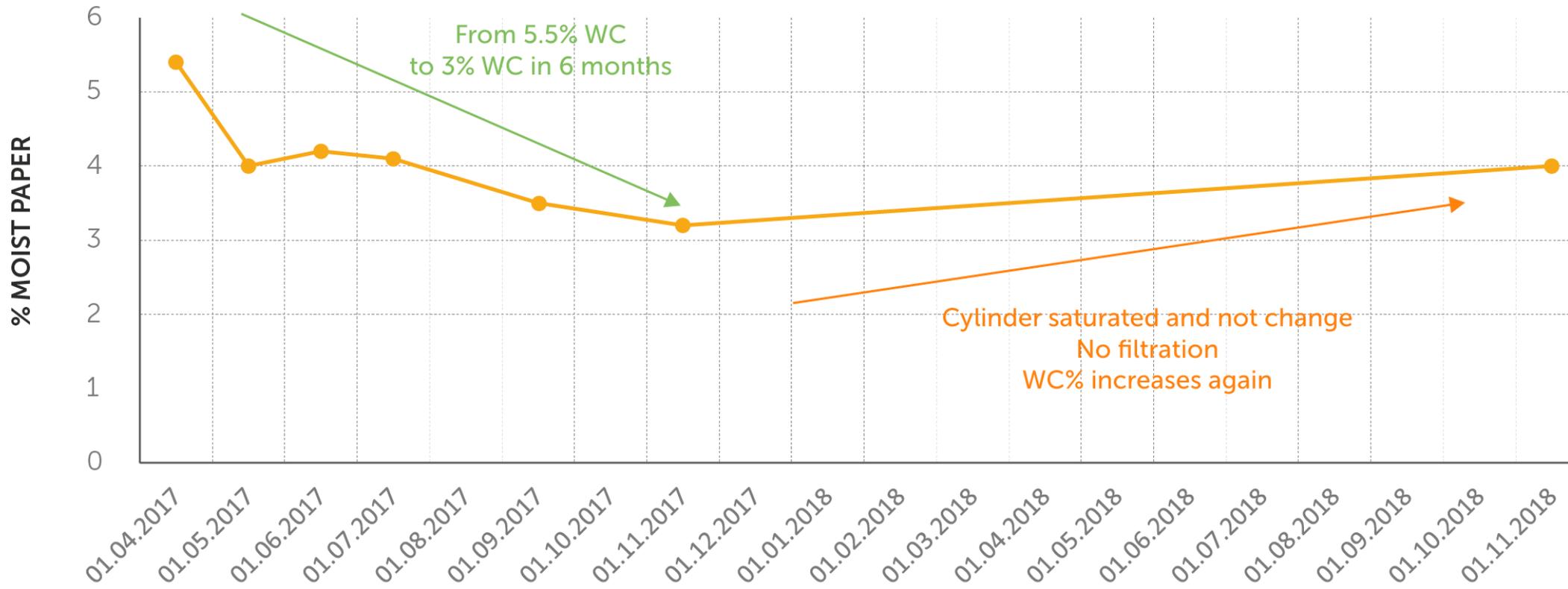
FIRST: A SUCCESSFUL INSTALLATION



RESULTS



RESULTS



MORE THAN 3000 UNITS INSTALLED



 Argentina	 Texas (USA)	 UK	 UK	 Zambia	 Cambodia	 UAE
						

- Salto Grande
- Hydroelectric power plant
- 20 units in operation

- Covanta
- Power Generation Waste to Energy
- 1 unit

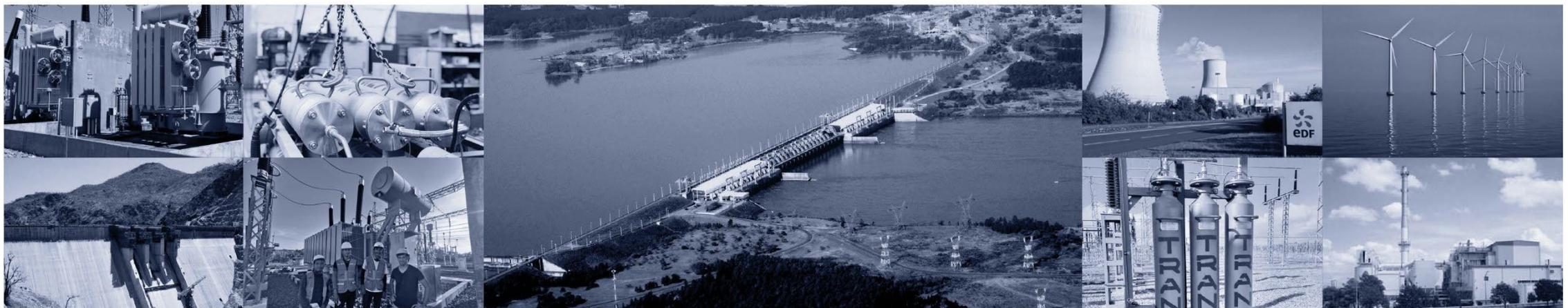
- EDF Energy
- Nuclear power plant
- 80 units in operation

- NNG
- Wind farm off shore generation
- 6 units in operation

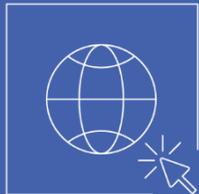
- ZESCO
- Kafue gorge hydroelectric power station
- 11 units in operation

- EDC Transmission
- 9 units in operation

- Emirates Global Aluminium
- 50 units in operation



THANK YOU. QUESTIONS?



HOW TO MARKET IT?

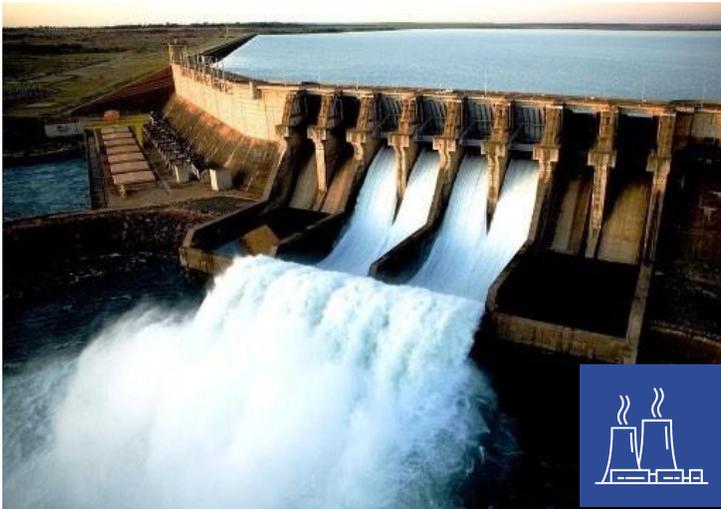


WHAT IS A GOOD CUSTOMER FOR TRANSEC?

1st

**HIGH AVERAGE LOAD + UNSTABLE LOAD =
FASTER CREATION OF MOISTURE**

- Hydro power plants and Renewables sometime do peak shaving (unstable load)
- Steel, Aluminium industries are required very large power with very unstable loads



WHAT IS A GOOD CUSTOMER FOR TRANSEC?

2nd

WHEN STOPPING A TRANSFORMER FOR MAINTENANCE IS “NOT POSSIBLE” OR TOO COSTLY

- When there is no backup transformer. Generally true for Power Generation
- When the transformer is installed in a very remote area (difficult access)



WHAT IS A GOOD CUSTOMER FOR TRANSEC?



3rd

WHEN THE TRANSFORMER FACES HIGH TEMPERATURES + VARIATIONS + OUTSIDE HUMIDITY

- High Outside temperatures will raise the oil temperature and lower its cooling effect which leads to more moisture creation inside the insulation paper
- Variations of Temp. will create moisture movements between paper & oil speeding up the depolymerization process
- High outside humidity will possibly ingress the transformer via the breather

4th

WHEN THE END USER IS PRIVATE RATHER THAN PUBLIC

- Private companies tend to have a faster decision process
- They are also more driven by cost savings which Transec could offer (lower maintenance cost, lower risk, longer life of assets)

WHAT IS A GOOD CUSTOMER FOR TRANSEC?



1st WHEN THE MOISTURE % IN PAPER REACHES 2%

- Before that level the creation of moisture in paper is relatively slow and the effect on BDV is limited
- Above this level the speed of moisture creation is increasing very fast and therefore affects BDV & Life expectancy

2nd ON A NEW TRANSFORMER

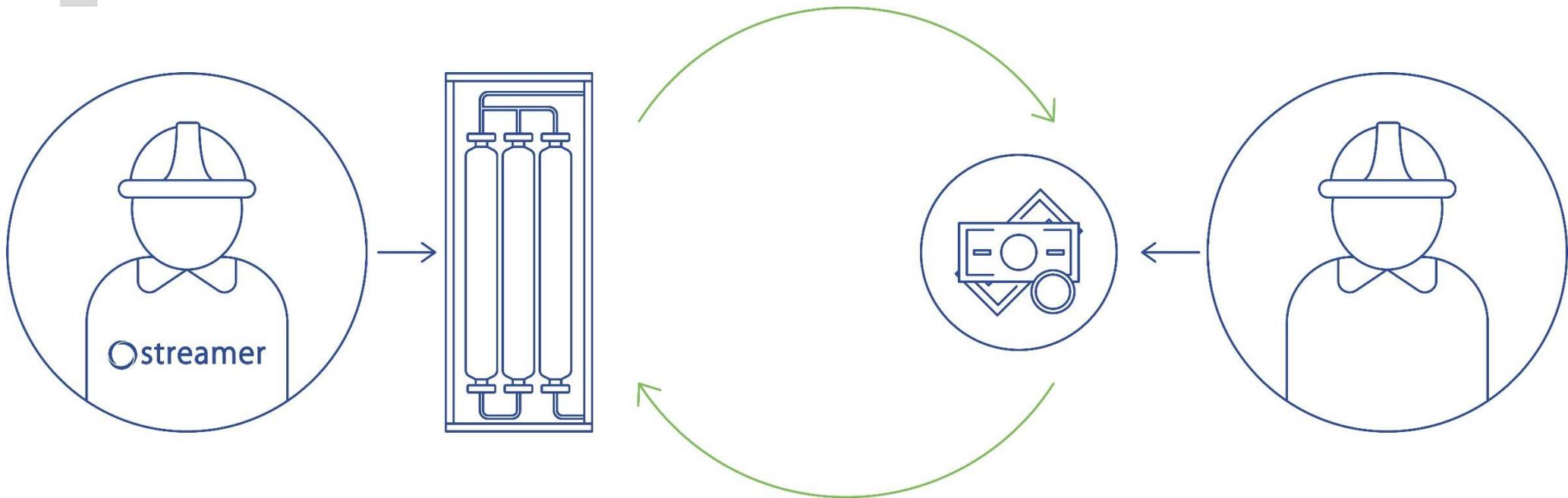
- That way, most of the moisture created will be extracted.
A stable % of moisture will be maintained and life expectancy will be maximized.

3rd WHEN THE MOISTURE LEVEL IS VERY HIGH (ABOVE 2%) AND IT IS NOT POSSIBLE OR WORTH STOPPING THE TRANSFORMER FOR MAINTENANCE

- Installing TRANSEC will have immediate (month) positive effect on BDV which will make the transformer safer
- However effect on life expectancy will be lower since lot of damages have been done already & since there is a lot of water to remove to reach back a good % level

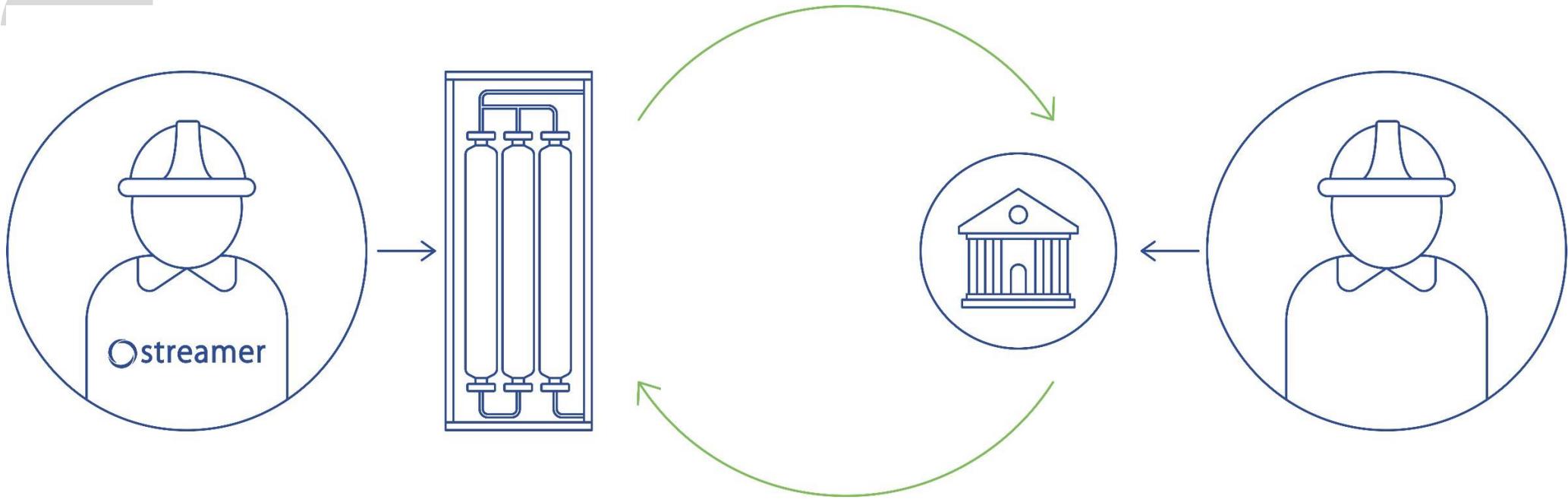
DIFFERENT WAYS TO OFFER TRANSEC

#**1** **SELLING THE EQUIPMENT.
ALL OTHER SERVICES (INSTALLATION, REGENERATION)
HAVE TO BE BOUGHT SEPARATELY.**



DIFFERENT WAYS TO OFFER TRANSEC

#2 SELLING THE EQUIPMENT BUT THROUGH A LOCAL LEASING BANK. CUSTOMER CAN THEREFORE PAY MONTHLY. AT END OF LEASING, CUSTOMER OWNS THE DEVICE.

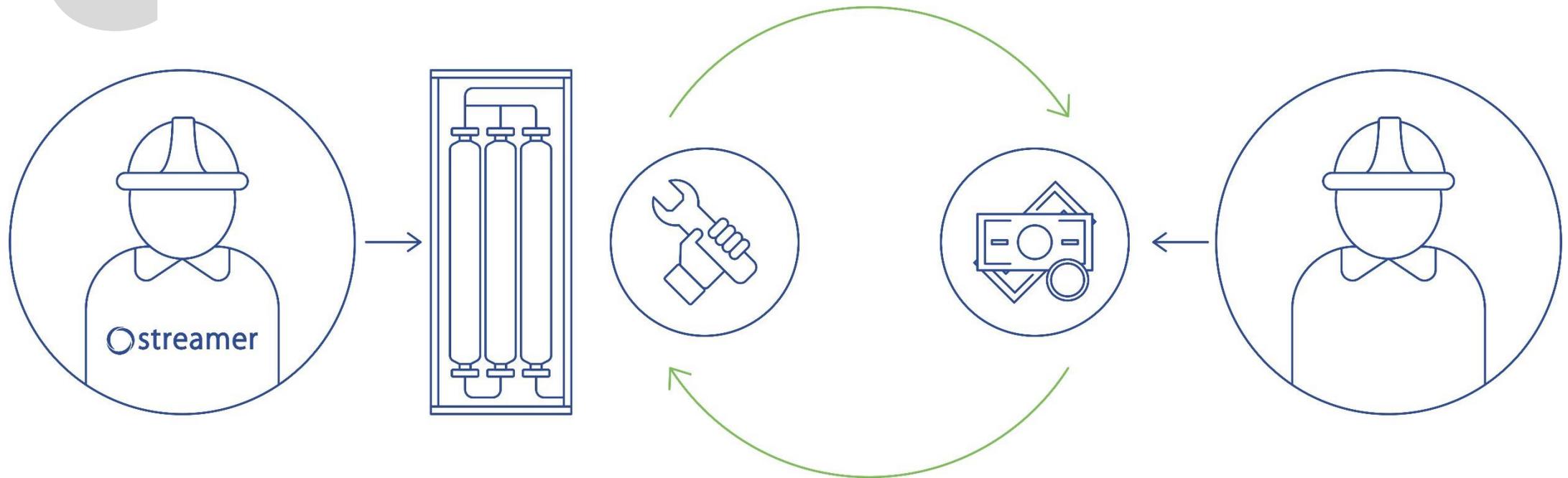


DIFFERENT WAYS TO OFFER TRANSEC

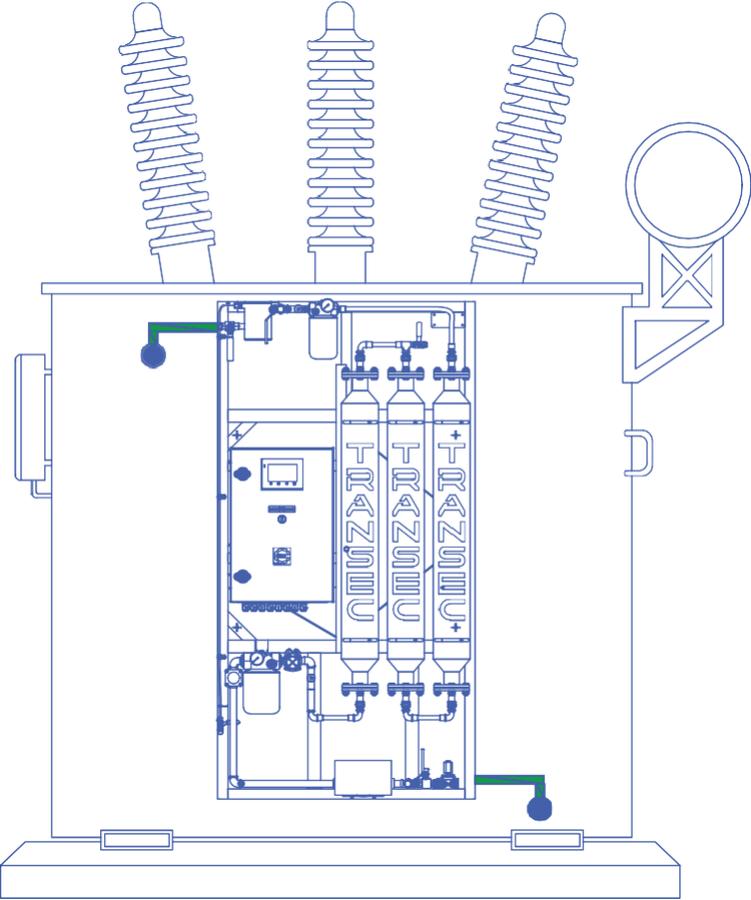
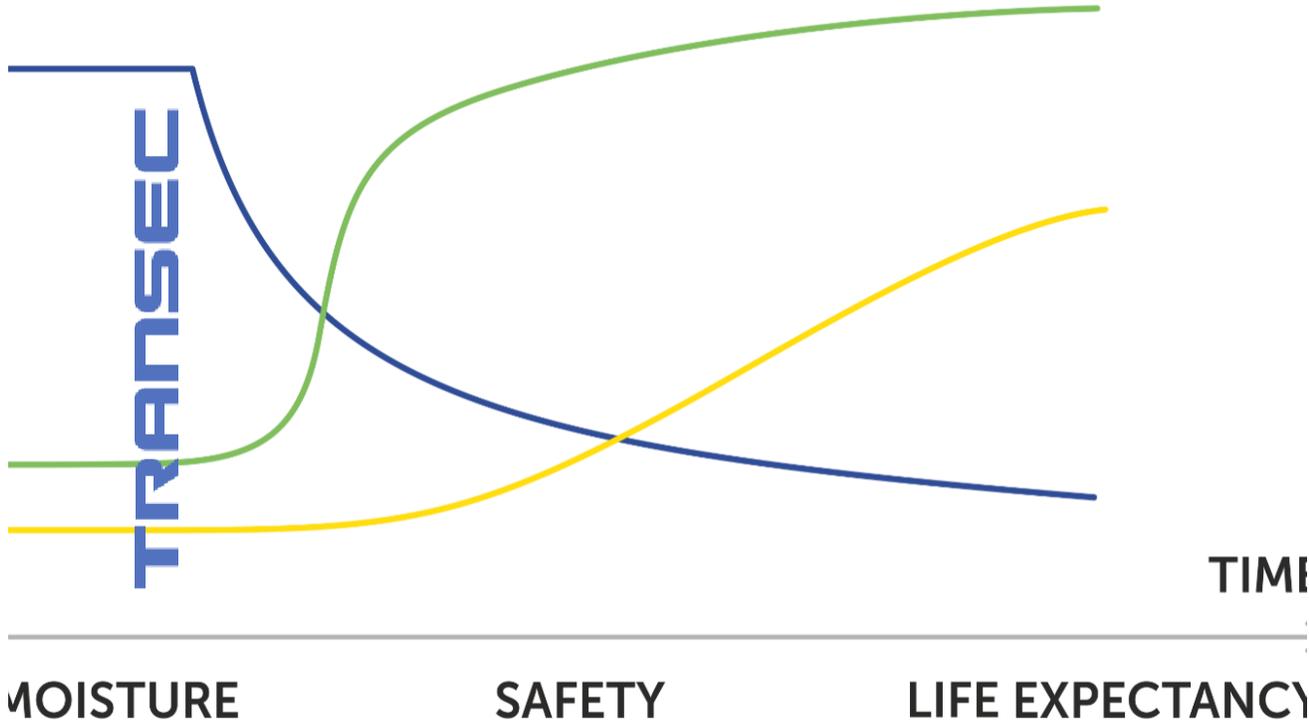
#3 THE SERVICE PACKAGE: WE GUARANTEE PROPER WATER EXTRACTION

We offer a full package including the unit, the installation, the maintenance + yearly check & the regeneration for a period of 3 to 5 years

Customer can pay monthly or quarterly. At end of contract, customer owns the Transec unit



FOR ONE TRANSFORMER OR SEVERAL?



FOR ONE TRANSFORMER OR SEVERAL?

