
ARCHROMA
LIFE ENHANCED
TOWARDS SUSTAINABLE TEXTILES
Balancing cost and compliance

A changing environment…….

Banned Azos are the main problem	RSL's requested to protect the Brand Image with consumers	Confrontational customer discussions regarding cost/price	Water is "free" and energy unseen

External Pressures

Ø ZDHC
Zero Discharge of Hazardous Chemicals

Minimizing hazard, risk and pollution	RSL, MRSL, audits and chemical management frameworks expected	Collaborative value chain discussions	True cost and impact of textile manufacturing measurable

Key market challenges pressure on brands on pollution


PFCs
PHTHALATES
NP
NPE
CADMIUM
chemicals in children's clothing from
a wide range of well-known brands
GREENPEACE

Key ecological market drivers

- NGOs are aggressively attacking reputable brands for the environmental damage
- Brands are now looking at impurities in the chemical drum (MRSL) and not only what is left on the garment (RSL)
- Consumers are not well informed to make the correct buying decisions about sustainable garments
- Energy and Water prices are dramatically increasing adding costs to garment


We continuously challenge the status quo
in the deep belief that we can make our
industry sustainable.

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Commitment to sustainability

bluesign® SYSTEM PARTNER

Sustainable Apparel Coalition

REACH COMPLIANCE

GLOBAL ORGANIC TEXTILE STANDARD · GOTS ·

TextileExchange
Creating Material Change

CONFIDENCE IN TEXTILES
Tested for harmful substances
according to Oeko-Tex® Standard 100
00000000 Institute

Ø ZDHC
Zero Discharge of Hazardous Chemicals


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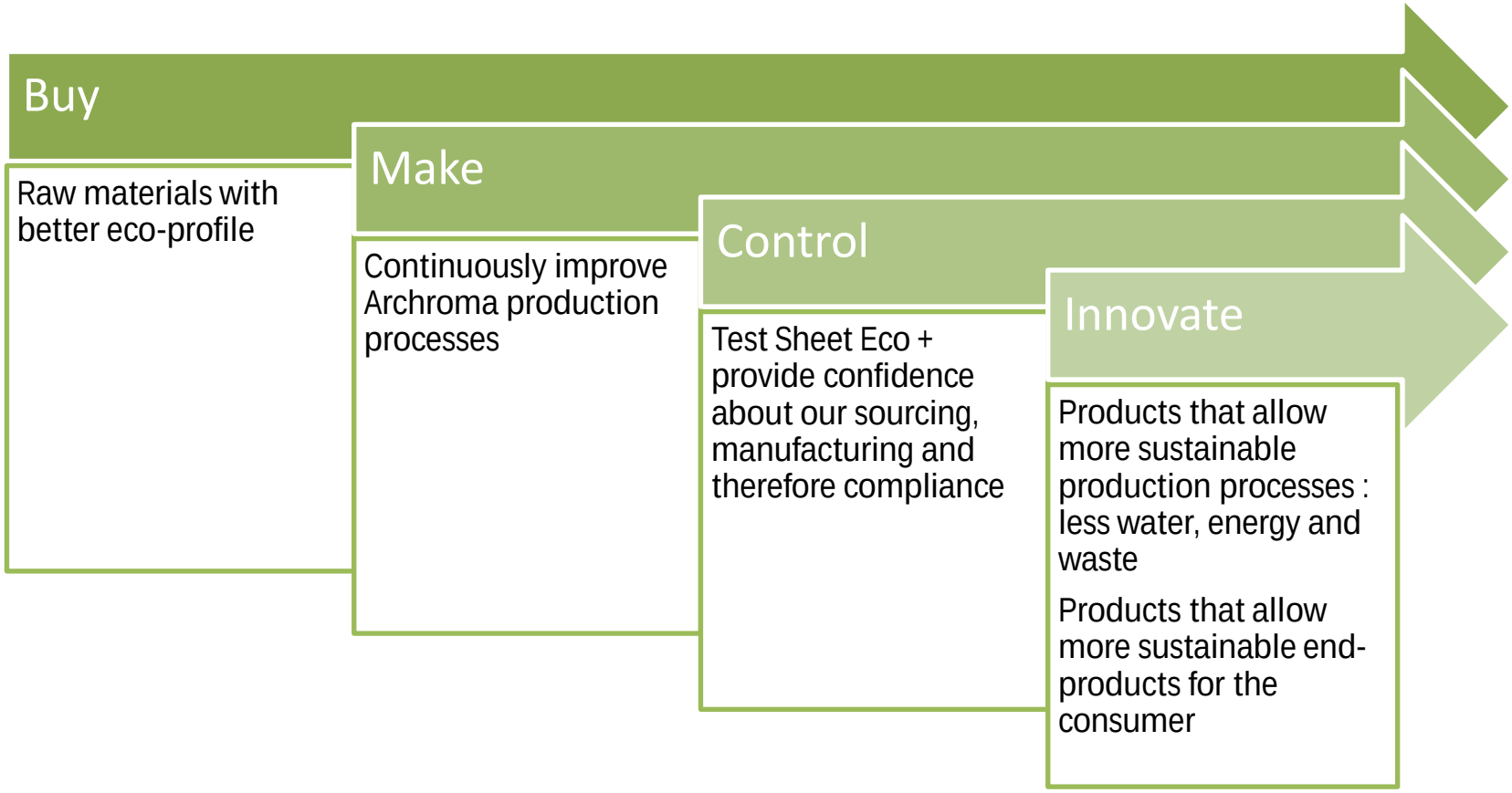
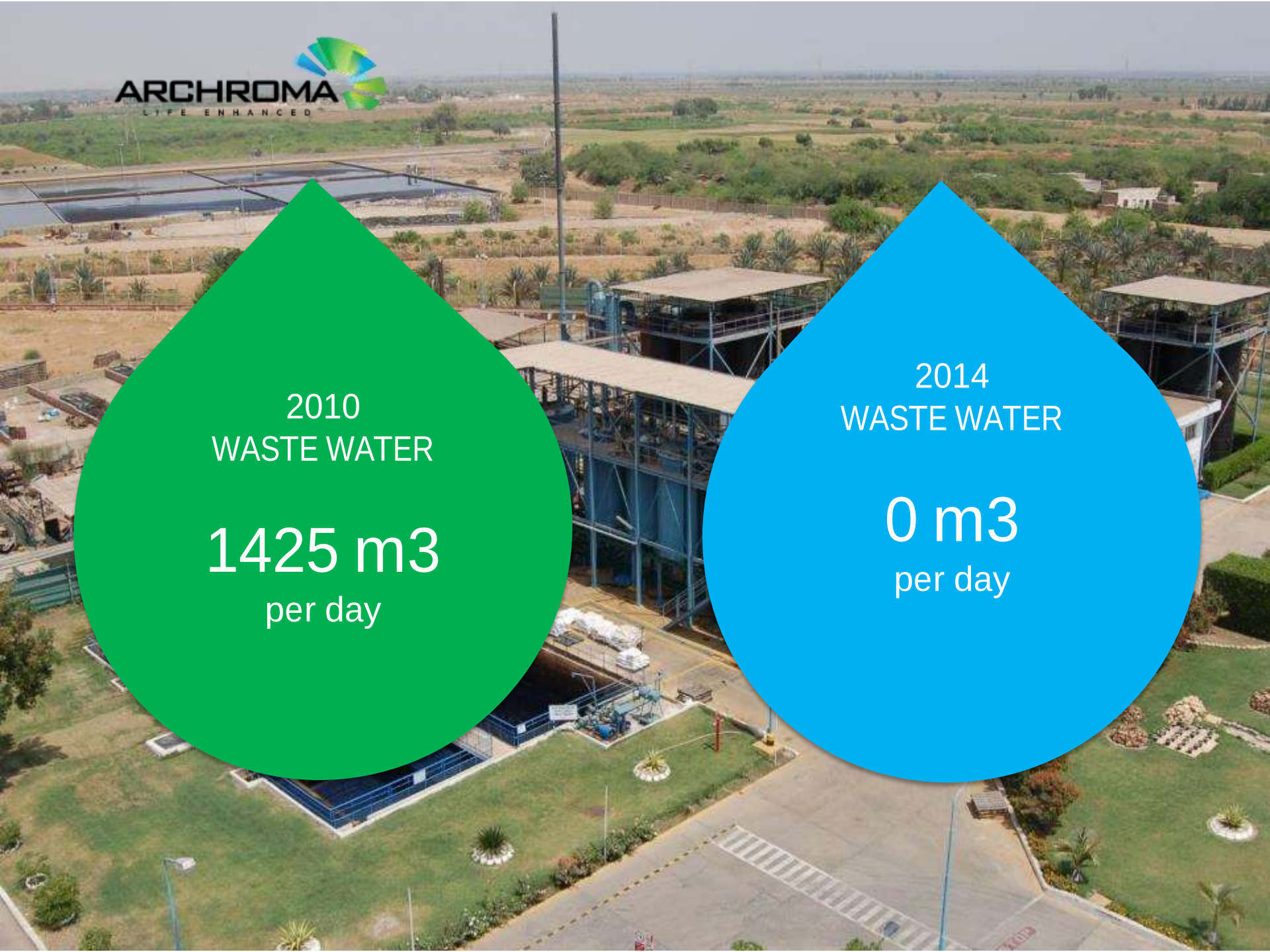
clean up its own backyard !

Archroma textile sustainability core values




ARCHROMA
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2010
WASTE WATER
1425 m3
per day
2014
WASTE WATER
0 m3
per day

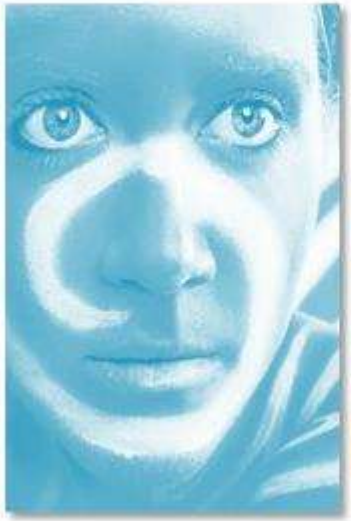
Dedicated global product stewardship experts

- A team of experienced chemists fully dedicated to textile chemicals in Archroma's Product Stewardship departments
- An international network of specialized Product Safety labs with eco testing facilities : Mumbai (India), Karachi (Pakistan), Tianjin (China)

Eco-advanced innovation flow

INNOVATE

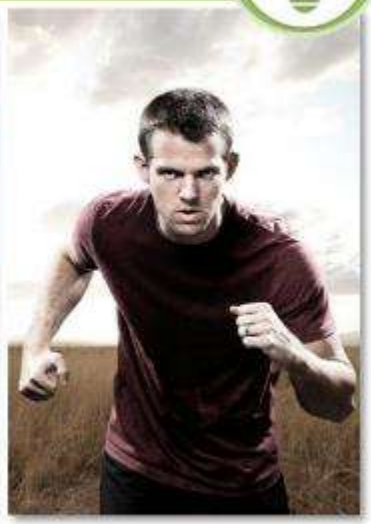
Smart Repel Hydro ®
Fluorine Free Durable water repellency



Blue Magic ®
All-in-one solution for discontinuous pretreatment

Advanced Denim ®
Archroma redefines the world of denim

Earthcolors ®
Agricultural waste base colors with traceability



Nylosan® S dyes
Metal Free acid dyes Polyamide and Wool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ONE WAY
Balancing the cost of compliance with sustainable production

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ONE WAY Objectives

Ecology & Environment

- Increase awareness at the mill level.
- Provide processes and products which can help to reduce carbon impact
- Provide products with higher biodegradability

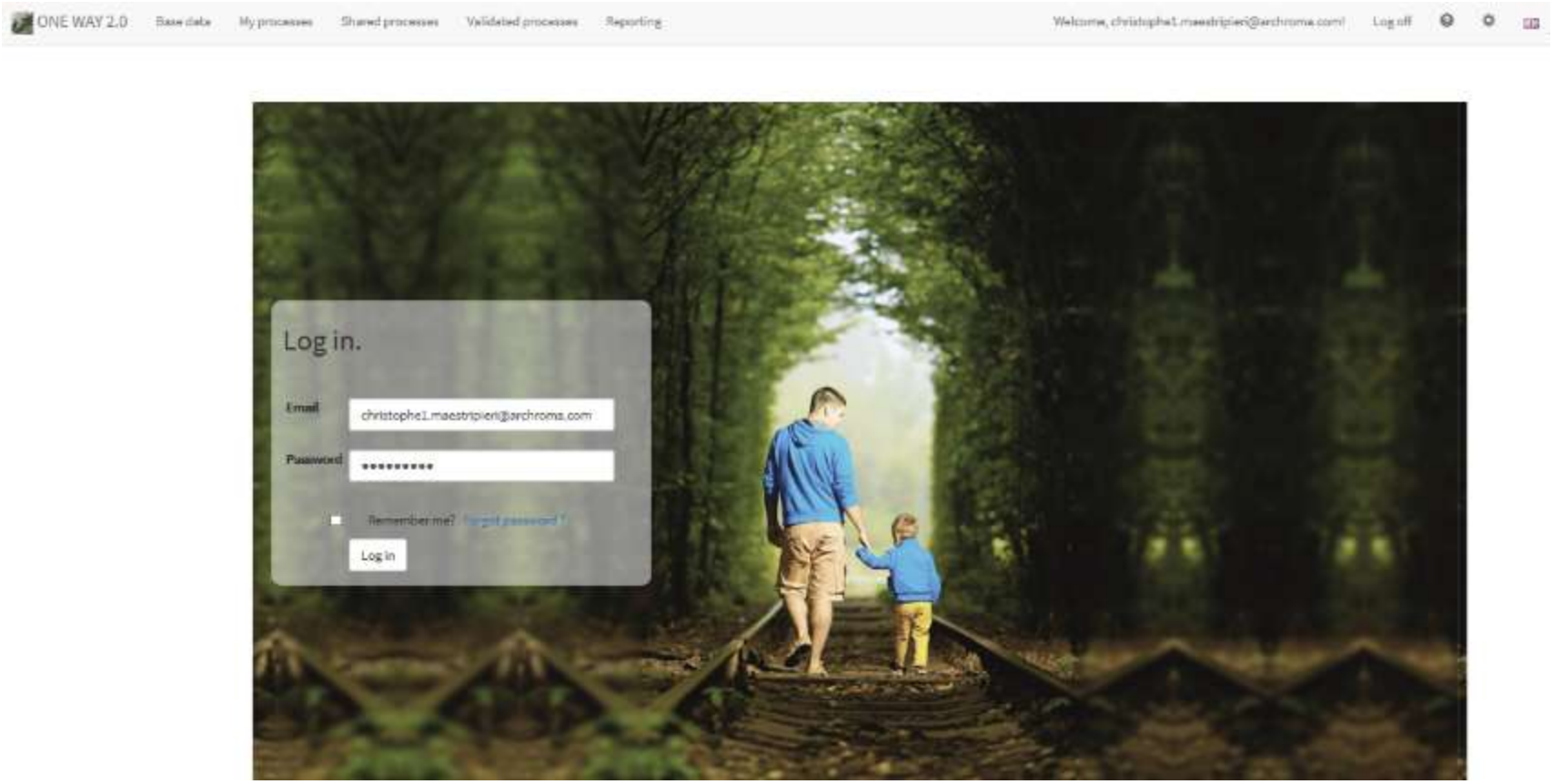
Economy & Efficiency

- Generate sizable cost saving & improve profitability at the customer.
- Reduce gas, electricity, water consumption.
- Improve efficiency & and reduce processing time.

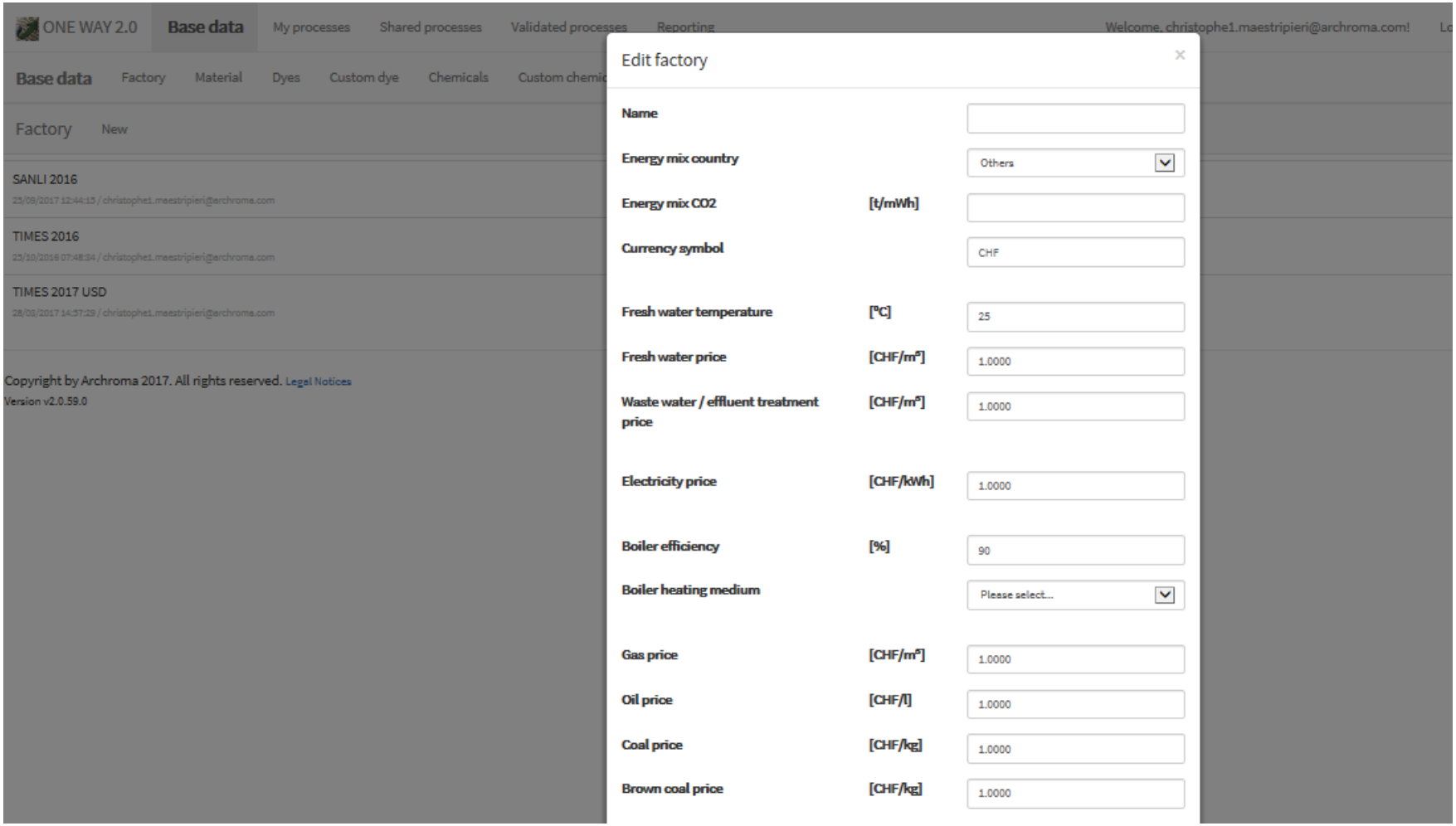
Measurable sustainability in action

ONE WAY three steps selection:

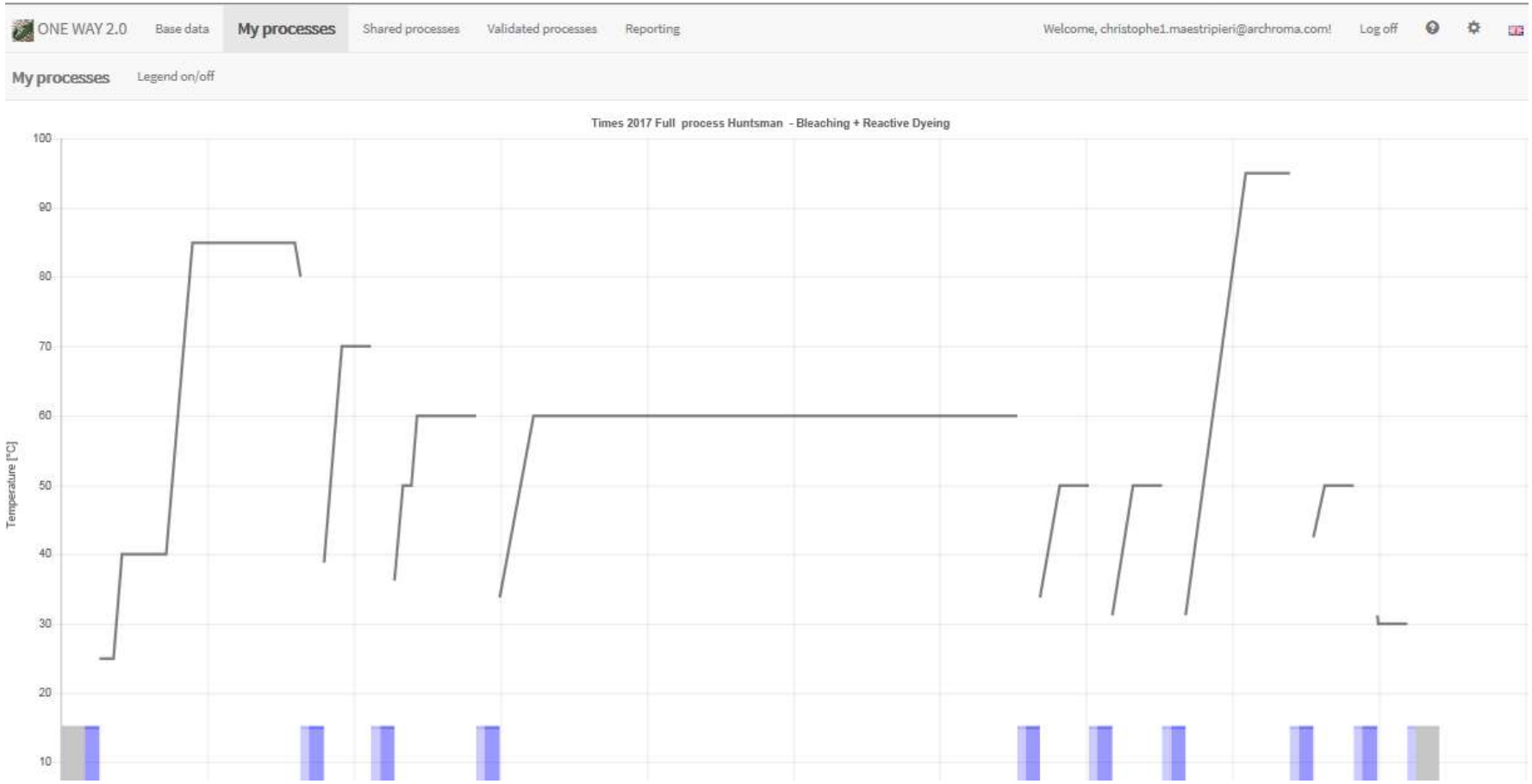
One Way – Web base access



One Way- Step 1 base data from the mill



One Way- Step 2 converting the process



One Way – Step 3 the process

ONE WAY 2.0 | Base data | **My processes** | Shared processes | Validated processes | Reporting | Welcome, christophe1.maestripieri@archroma.com!

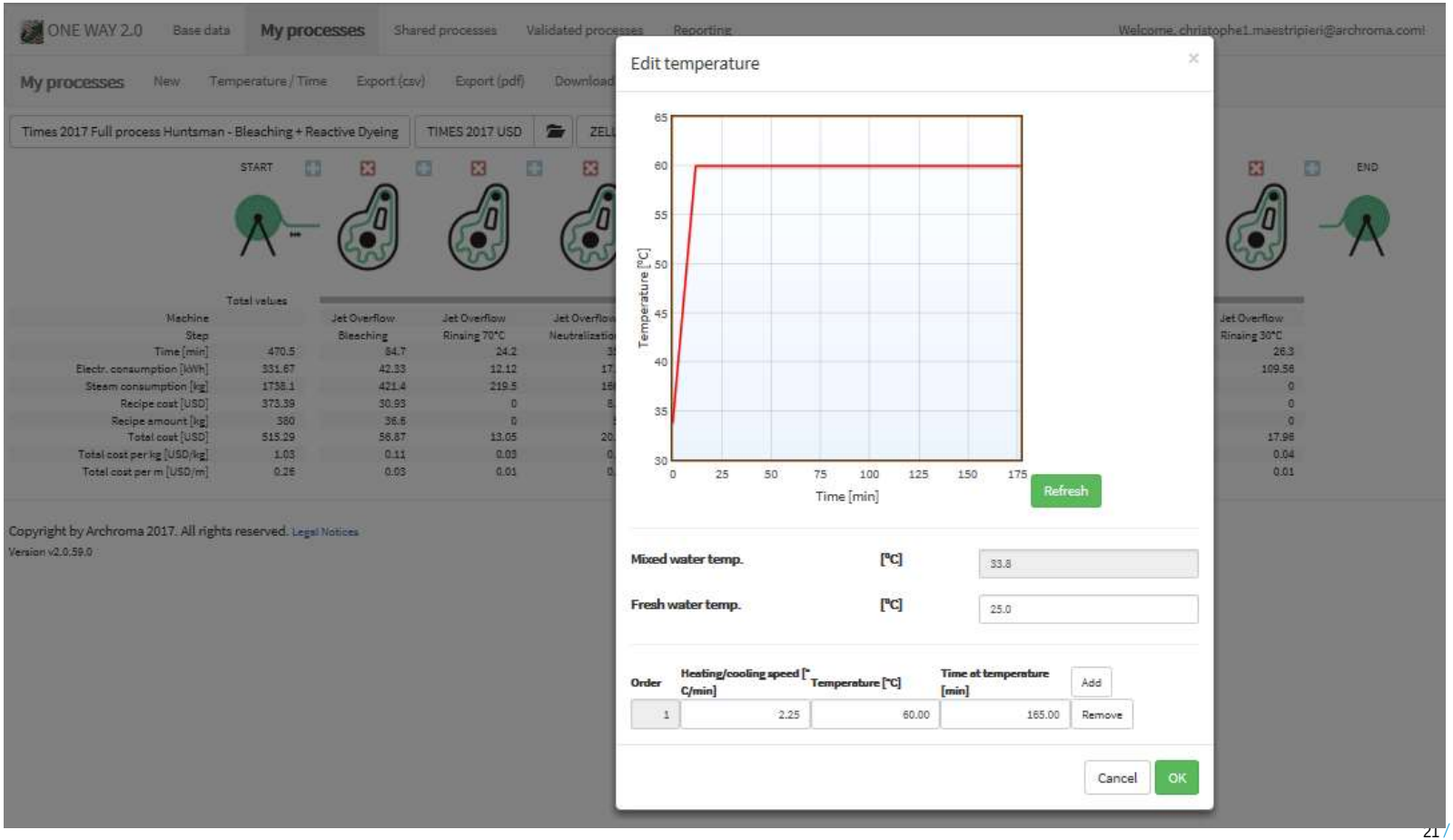
My processes | New | Temperature / Time | Export (csv) | Export (pdf) | Download

Times 2017 Full process Huntsman - Bleaching + Reactive Dyeing | TIMES 2017 USD | ZELLER | Times | 1961 m | 500 kg

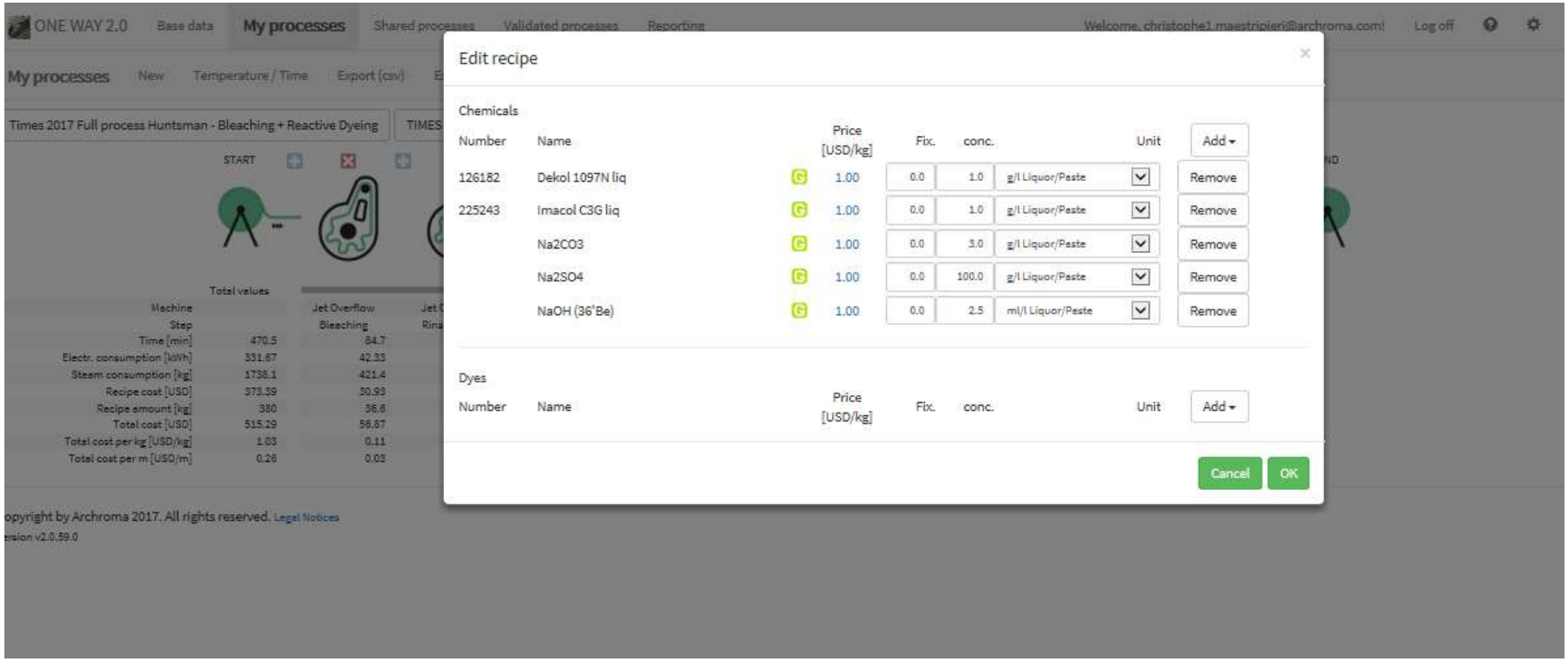
	Total values								
Machine		Jet Overflow	Jet Overflow	Jet Overflow	Jet Overflow	Jet Overflow	Jet Overflow	Jet Overflow	Jet Overflow	Jet Overflow
Step		Bleaching	Rinsing 70°C	Neutralization	Dyeing	Rinsing 50°C	Rinsing 50°C	Rinsing 95°C	Rinsing 50°C	Rinsing 30°C
Time [min]	470.5	84.7	24.2	35.8	184.7	24.6	25.1	43.6	21.7	26.3
Electr. consumption [kWh]	331.67	42.33	12.12	17.88	92.33	12.29	12.54	21.78	10.83	109.56
Steam consumption [kg]	1738.1	421.4	219.5	166.8	184.3	114.1	131.7	447.7	52.7	0
Recipe cost [USD]	373.39	30.93	0	8.39	322.5	3.72	1.86	6	0	0
Recipe amount [kg]	380	36.6	0	5.9	322.5	6	3	6	0	0
Total cost [USD]	515.29	56.87	13.05	20.44	346.52	13.06	11.86	28.61	6.94	17.96
Total cost per kg [USD/kg]	1.03	0.11	0.03	0.04	0.69	0.03	0.02	0.06	0.01	0.04
Total cost per m [USD/m]	0.26	0.03	0.01	0.01	0.18	0.01	0.01	0.01	0	0.01

Version v2.0.59.0

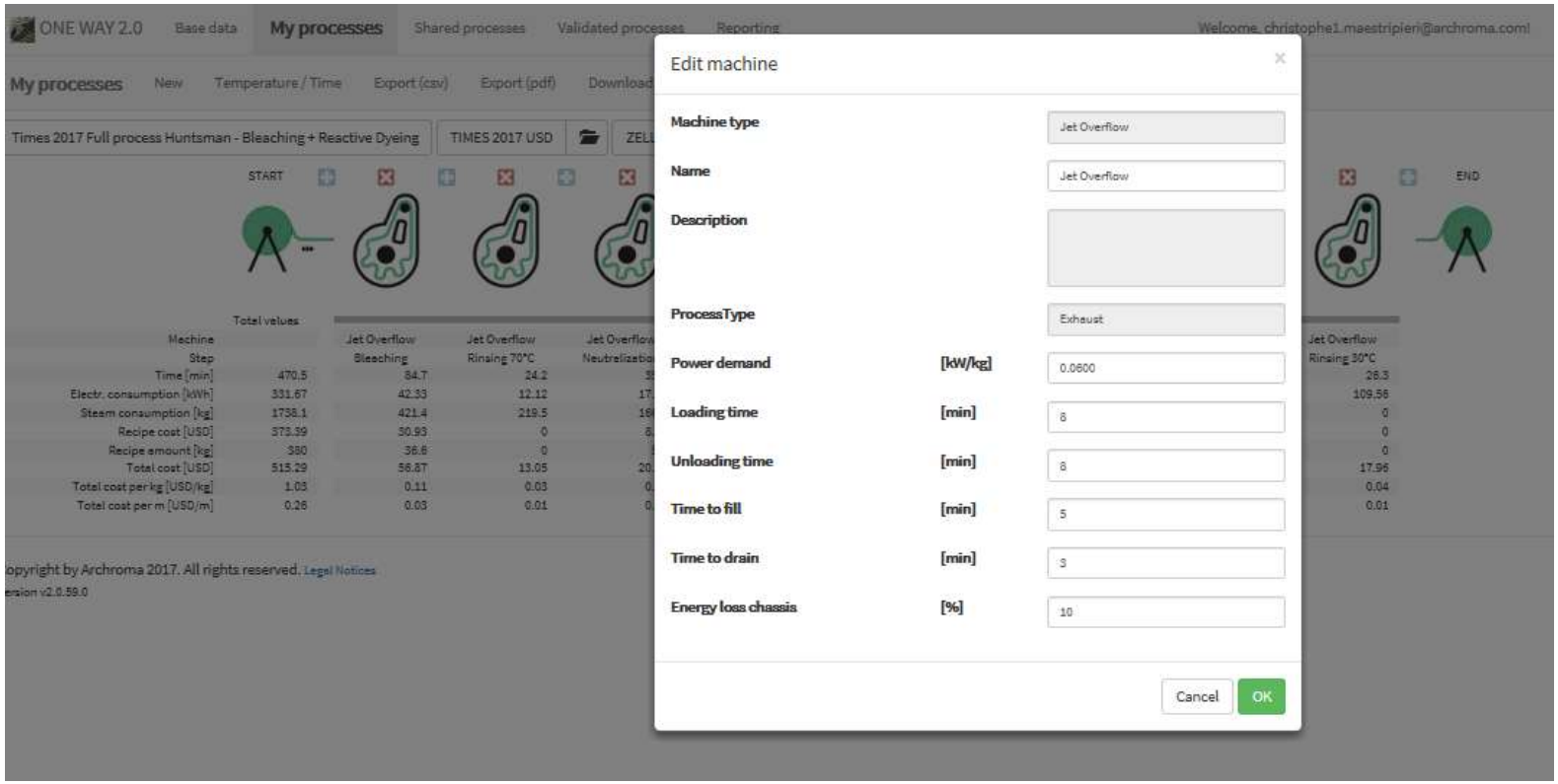
One Way – Step 3 the process temperature profile



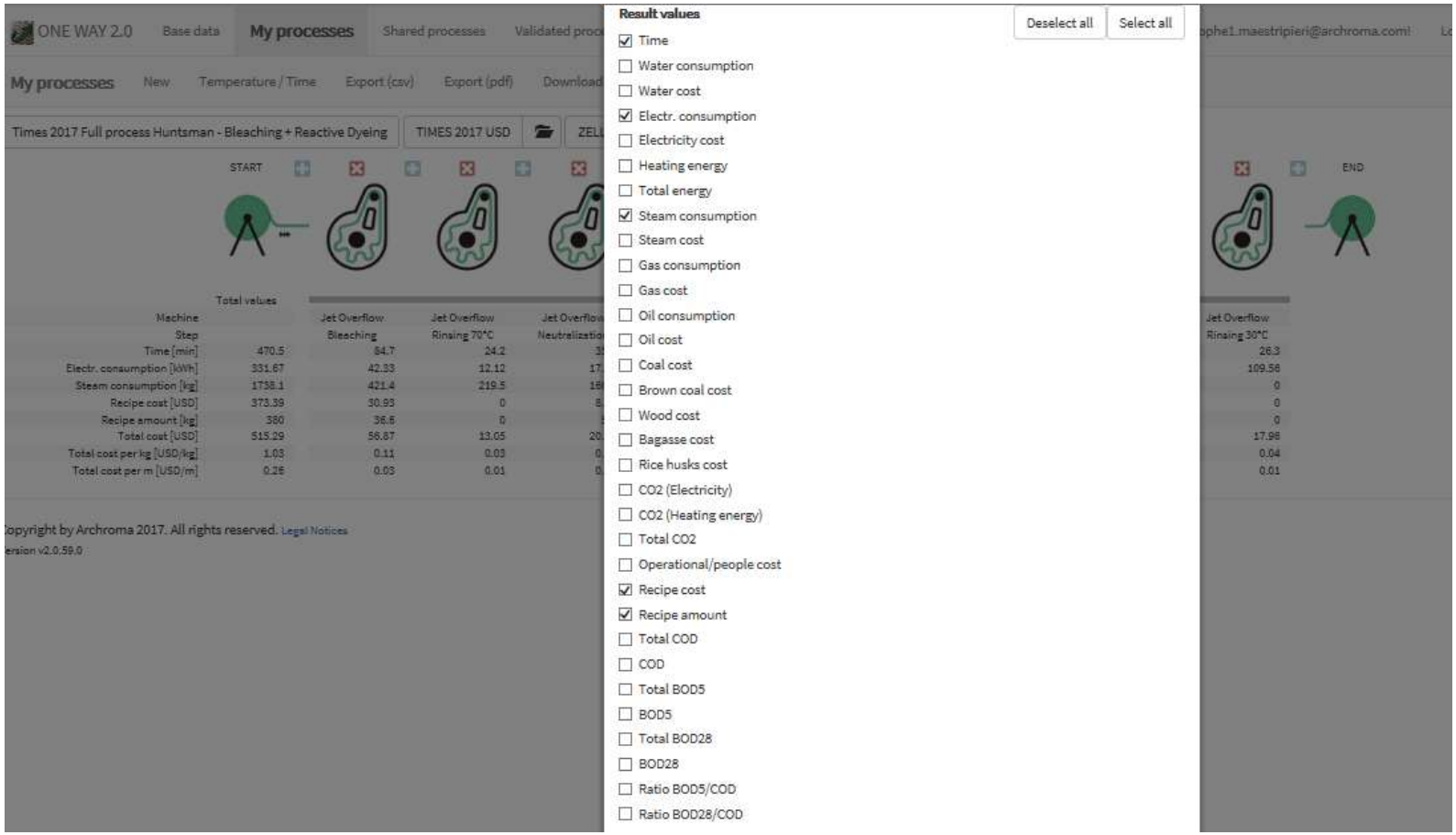
One Way – Step 3 the process recipe



One Way – Step 3 the process data



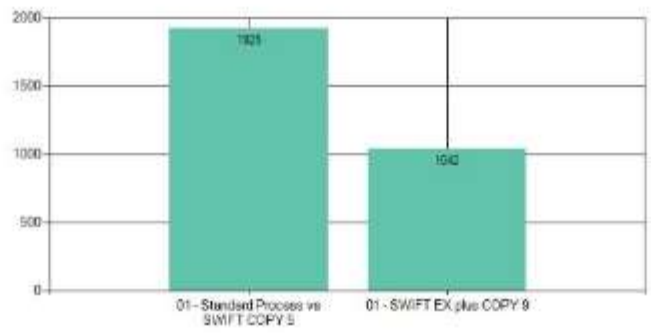
One Way – Step 4 the process information requested



One Way – Step 5 the Report

	Cost	Time	Water	Energy	Chemicals	CO2 footprint	Water emission	Batch [kg]
Standard :01 - Standard Process vs SWIFT COPY 5							-	300
Process A :01 - SWIFT EX plus COPY 9	-46 %	-41 %	-49 %	-55 %	-15 %	-56 %	- - %	300

Total cost [EUR]

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EXAMPLE


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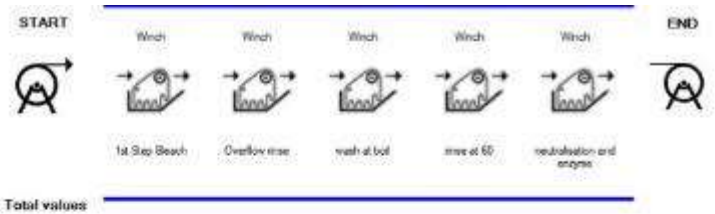
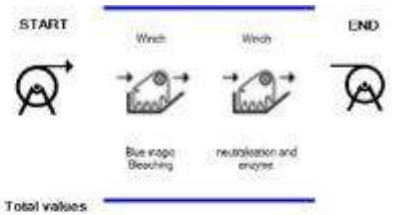
BLUE MAGIC
A bleaching auxiliary that provides
productivity gains with dramatically reduced
environmental impact in water and energy

Digitized benchmark and optimized **mill's bleaching** process



Total values						
Time [min]:	268.5	124.5	38	39	27	40
Water consumption [l]:	6400	1400	2300	900	900	900
Water cost [TK]:	83.2	18.2	29.9	11.7	11.7	11.7
Electr. consumption [kWh]:	89.5	41.5	12.67	13	9	13.33
Electricity cost [TK]:	447.5	207.5	63.33	65	45	66.67
Heating Energy [MJ]:	1051.51	400.52	154.45	334.5	74.82	57.22
Total Energy [MJ]:	1373.71	549.92	230.05	381.3	107.22	105.22
Steam consumption [kg]:	504.32	192.09	88.47	160.43	35.88	27.44
Steam cost [TK]:	165.67	63.1	29.06	52.7	11.79	9.01
Gas consumption [m³]:	42.92	16.35	7.53	13.65	3.05	2.34
Gas cost [TK]:	165.67	63.1	29.06	52.7	11.79	9.01
CO_2 (Heating Energy) [kg]:	83.65	31.88	14.68	26.62	5.96	4.55
Total CO_2 [kg]:	83.65	31.88	14.68	26.62	5.96	4.55
Recipe cost [TK]:	451.2	451.2	-			
Total cost [TK]:	1147.57	749.01	122.29	129.4	62.49	87.38
Total cost per kg [TK/kg]:	5.74	3.7	0.61	0.65	0.34	0.44

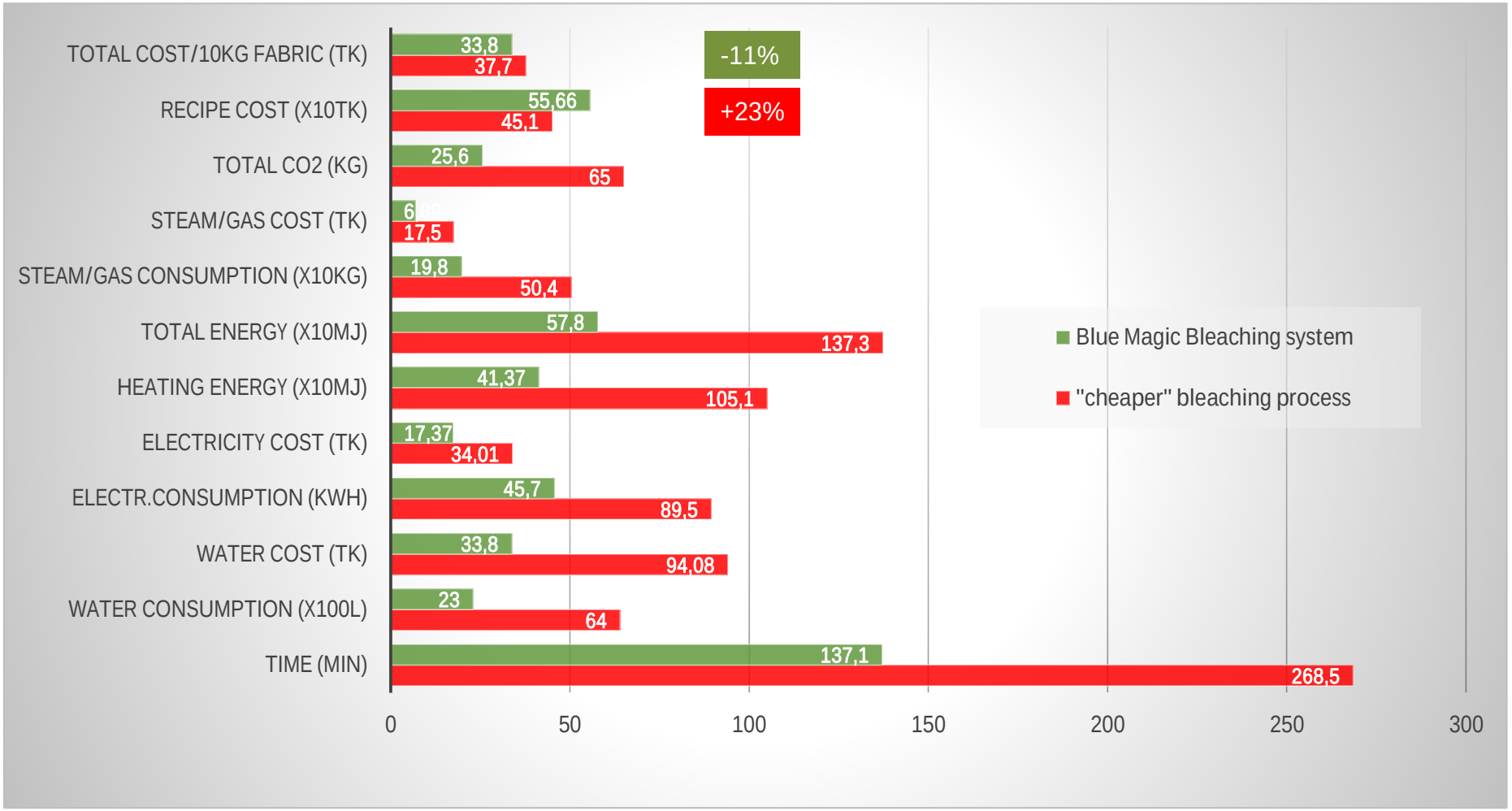


Total values			
Time [min]:	137.1	94.5	42.6
Water consumption [l]:	2300	1400	900
Water cost [TK]:	29.9	18.2	11.7
Electr. consumption [kWh]:	45.7	31.5	14.2
Electricity cost [TK]:	228.5	157.5	71
Heating Energy [MJ]:	413.72	400.52	13.2
Total Energy [MJ]:	578.24	513.92	64.32
Steam consumption [kg]:	198.43	192.09	6.33
Steam cost [TK]:	65.18	63.1	2.08
Gas consumption [m³]:	16.89	16.35	0.54
Gas cost [TK]:	65.18	63.1	2.08
CO_2 (Heating Energy) [kg]:	32.93	31.88	1.05
Total CO_2 [kg]:	32.93	31.88	1.05
Recipe cost [TK]:	556.68	556.68	-
Total cost [TK]:	860.26	795.48	64.78
Total cost per kg [TK/kg]:	4.4	3.96	0.42

- Large amounts of caustic, leading to :
  - Long rinse cycles required to remove
  - Increased TDS in the Waste Water
  - Potential for subsequent yellowing if not removed
- Longer process leads to more fibre damage and weight loss

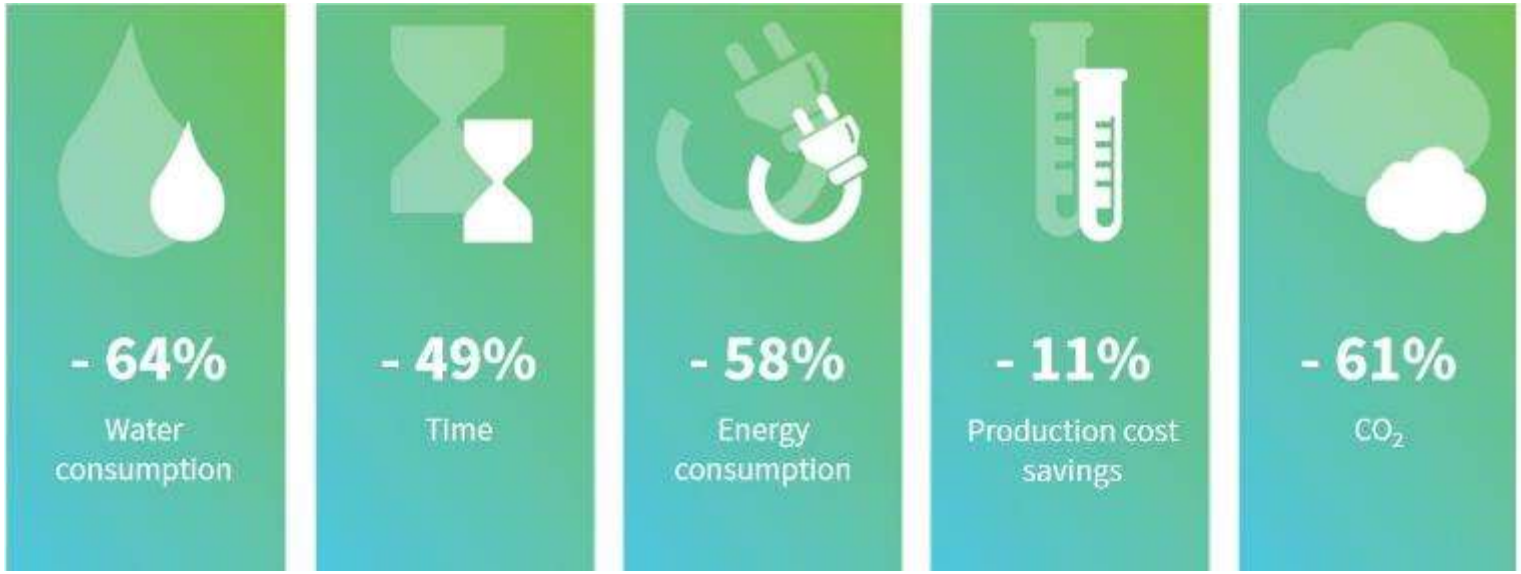
- Less resource utilisation (water, energy, time)
- Higher productivity
- Less fabric weight loss
- Reduced COD and BOD values compared to standard processing
- Maximal absorbency
- Higher degree of whiteness

Calculation output of results



Score card

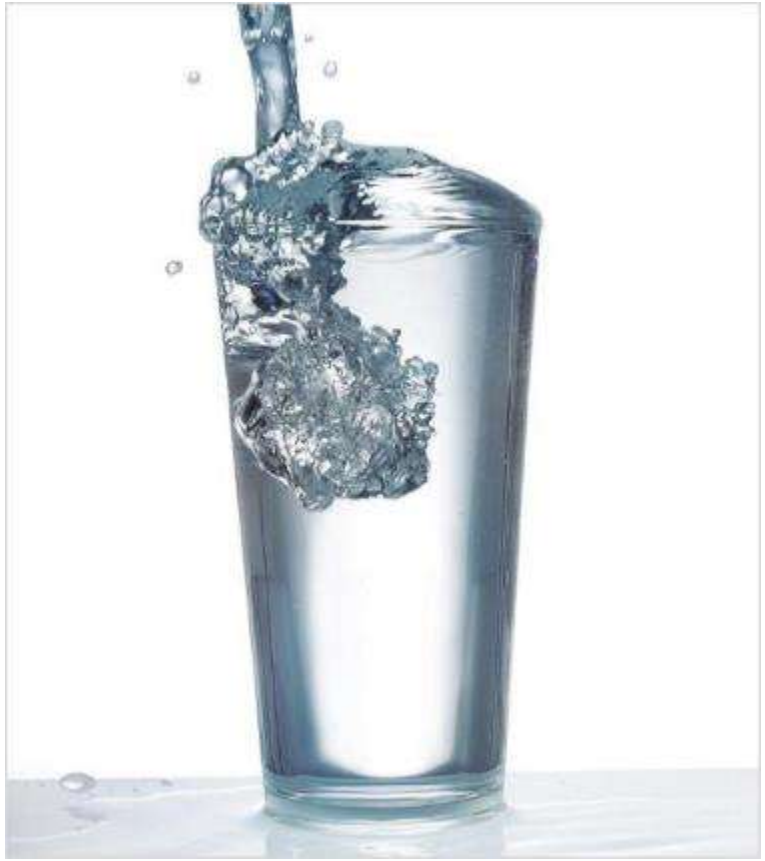
*All without any additional investment in machinery



- Peace of mind that dyes are RSL/MRSL compliant
  - Free of APEO, reduced heavy metals and phosphonates
- Dramatically reduced water, energy and CO_2 emissions
- Actual overall cost savings (~11%)
- Increased capacity or opportunity time (~49%)
- Additional savings in volume of cotton loss (~2%)

What do those savings mean for a daily factory output ?

A factory bleaching 35 MT fabric/day



700,000L water/day savings

Based on 2L recommended intake of water

Would satisfy 350,000 people/day

What do those savings mean for a daily factory output ?

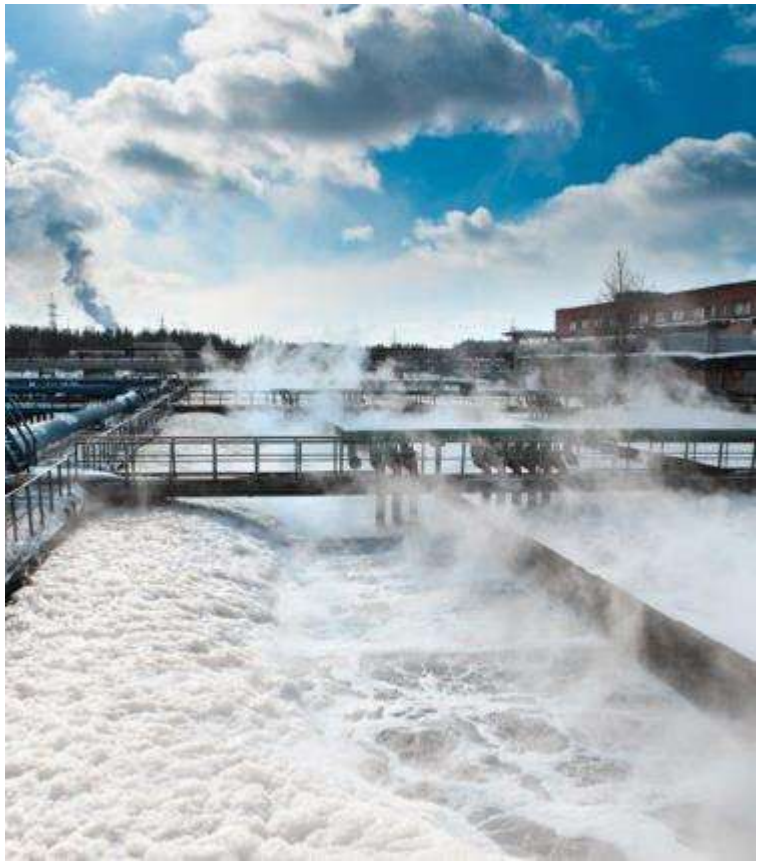
A factory bleaching 35 MT fabric/day

7 MT CO2 less emissions/day

Daily emission of ~430,000 standard cars

What do those savings mean for a daily factory output ?

A factory bleaching 35 MT fabric/day



12 MT less NaOH/day

<u>Dramatically less salt in the WWTP (12MT NaOH also needs 12MT HCL)</u>

What do those savings mean for a daily factory output ?

A factory bleaching 35 MT fabric/day

7,700 kWh electricity/day savings

Enough electricity to power 300 homes/day in Dhaka

Drimaren® HF reactive dyes for cellulose

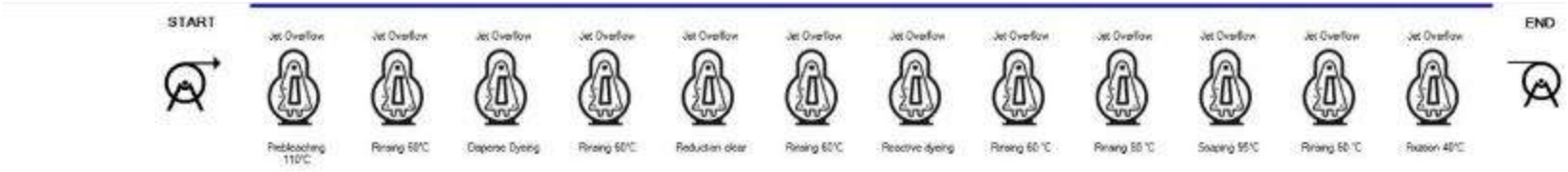
- Full color range
- High degree of fixation to ensure minimal colour in effluent
- High productivity and process reliability
- Meets the fastness and ecological standards of leading brands

Foron® S-WF dyes for polyester and blends

- Full colour range
- meets the highest wet fastness requirements of leading brands
- Full Range of alkali clearable disperse dyes, where high wash fastness can be achieved in continuous dyeing without an intermediate reduction clearing process.

The traditional dyeing process for disperse/reactive dyeing of PES/CEL blends (Europe)

A very long and costly dyeing process, permitting a maximum of two dye lots per machine per day.

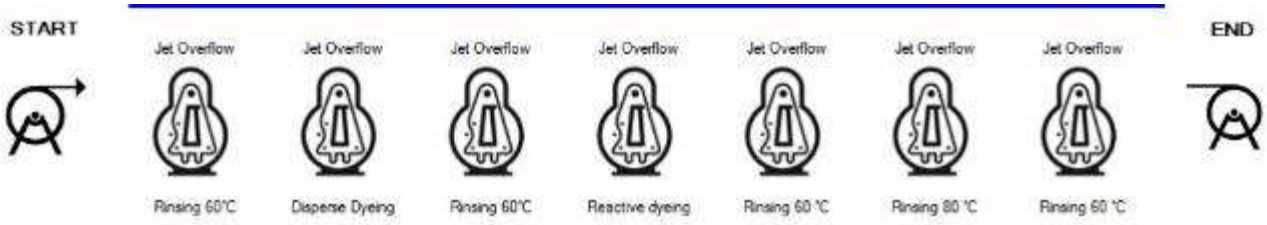


Total values													
Time [min]	703	96	26.33	144	25.67	46.5	25.33	139	26.33	26.33	60.5	24	63
Water consumption [l]	29400	3000	2400	2400	2400	2400	2400	2400	2400	2400	2400	2400	2400
Water cost [EUR]	138.18	14.1	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28
Electr. consumption [kWh]	182.76	24.96	6.85	37.44	6.67	12.09	6.59	36.14	6.85	6.85	15.73	5.24	16.38
Electricity cost [EUR]	27.42	3.74	1.03	5.62	1	1.81	0.99	5.42	1.03	1.03	2.36	0.94	2.46
Heating Energy [MJ]	5009.23	915.77	182.15	1118.95	182.15	403.34	169.14	780.66	268.18	268.18	663.56	182.15	-
Total Energy [MJ]	5667.24	1000.63	206.8	1253.73	206.18	446.86	192.06	910.76	232.82	232.82	720.19	264.62	58.97
Steam consumption [kg]	2402.51	436.82	87.36	536.66	87.36	193.45	81.12	374.42	99.84	99.84	318.25	87.36	-
Steam cost [EUR]	111.13	20.21	4.04	24.82	4.04	8.95	3.75	17.32	4.62	4.62	14.72	4.04	-
Gas consumption [m³]	368.38	39.61	6.12	37.61	6.12	13.56	5.69	26.24	7	7	22.3	6.12	-
Gas cost [EUR]	111.13	20.21	4.04	24.82	4.04	8.95	3.75	17.32	4.62	4.62	14.72	4.04	-
Total cost [EUR]	513.73	53.05	16.35	58.82	16.32	37.04	16.02	214.92	16.93	16.93	31.36	16.26	19.74
Total cost per kg [EUR/kg]	1.71	0.18	0.05	0.2	0.05	0.12	0.05	0.72	0.06	0.06	0.1	0.05	0.07

For many years attempts were made to find ways to dye PES/CEL fibre faster, however

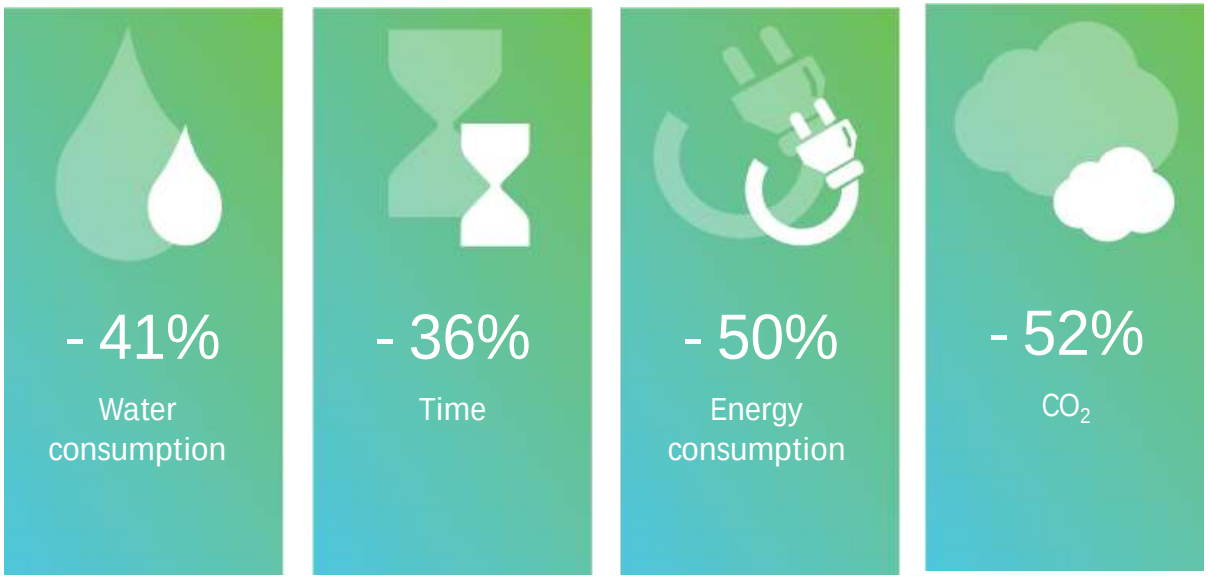
- Not all shades could be dyed by a given process,
- The processes proved to be unreliable, giving large batch to batch variations
- Off-shade batches couldn't be corrected easily

SWIFT + Process (Europe)



Total values								
Time [min]:	453.33	37.67	164	25.67	139	26.33	26.33	34.33
Water consumption []:	17400	3000	2400	2400	2400	2400	2400	2400
Water cost [EUR]:	81.78	14.1	11.28	11.28	11.28	11.28	11.28	11.28
Electr. consumption [kWh]:	117.87	9.79	42.64	6.67	36.14	6.85	6.85	8.93
Electricity cost [EUR]:	17.68	1.47	6.4	1	5.42	1.03	1.03	1.34
Heating Energy [MJ]:	2394.02	260.22	1118.95	182.15	208.18	208.18	208.18	208.18
Total Energy [MJ]:	2818.34	295.48	1272.45	206.18	338.28	232.82	232.82	240.31
Steam consumption [kg]:	1148.21	124.81	536.66	87.36	99.84	99.84	99.84	99.84
Steam cost [EUR]:	53.11	5.77	24.82	4.04	4.62	4.62	4.62	4.62
Gas consumption [m³]:	80.47	8.75	37.61	6.12	7	7	7	7
Gas cost [EUR]:	53.11	5.77	24.82	4.04	4.62	4.62	4.62	4.62
Total cost [EUR]:	364.07	21.34	73.1	16.32	202.22	16.93	16.93	17.24
Total cost per kg [EUR/kg]:	1.21	0.07	0.24	0.05	0.67	0.06	0.06	0.06

- Combined rinsing and pre-bleaching of the fabric after polyester dyeing
- Combined reduction clearing of the disperse dyes during the reactive dye fixation
- Suitable for all shades and all depths with easy corrective shading possible
- Optimum wet fastness level with the same handfeel for all shades



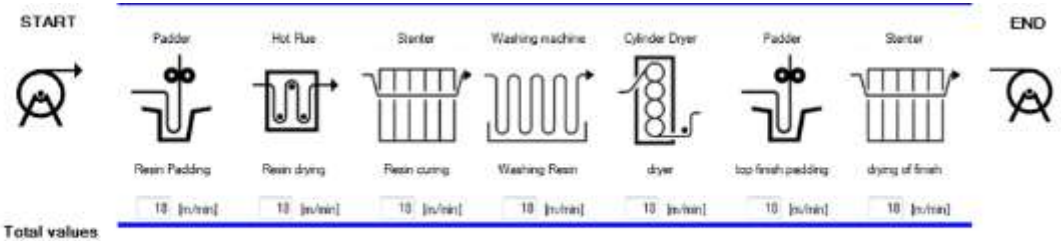
- Peace of mind that dyes are RSL/MRSL compliant
- Production time reduced more than 4 hours
- Large water savings :
  - Saves 40L/kg PES/Cotton fabric; in a 300kg batch = 12,000L/batch
- Dramatically reduced energy and CO2 emissions
- Increased capacity or opportunity time

Fixapret Resin WFF - Wrinkle Free & formaldehyde Free finish for woven fabrics

- Formaldehyde free finishes have been available for many years, however limited with respect to a conventional “non iron” finish performance
- A new chemistry which allowed the crosslinking to be more flexible which led to an Increased performance in durable press and also abrasion resistance

Conventional resin finishing process for shirting

With a requirement of < 16ppm formaldehyde

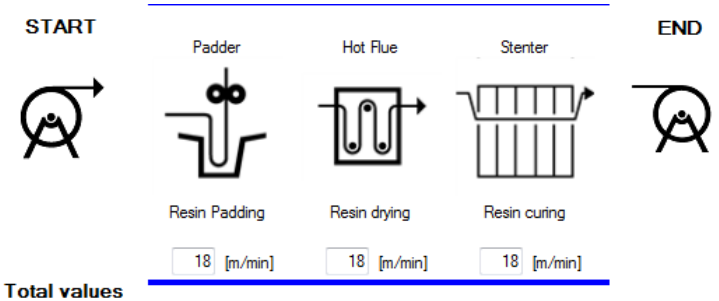


Total values								
Time [min]:	555.56	555.56	555.56	555.56	555.56	555.56	555.56	555.56
Water consumption [l]:	46237.04	2600	-	-	41537.04	-	2100	-
Water cost [USD]:	36.53	2.05	-	-	32.81	-	1.66	-
Electr. consumption [kWh]:	1644.29	500	225.6	33.08	180.56	138.89	500	66.16
Electricity cost [USD]:	151.27	46	20.76	3.04	16.61	12.78	46	6.09
Heating Energy [MJ]:	25691.47	-	4742.14	3188.77	2450.76	9860.67	-	5449.14
Total Energy [MJ]:	31610.91	1800	5554.3	3307.86	3100.76	10360.67	1800	5687.32
Steam consumption [kg]:	5904.76	-	-	-	1175.42	4729.34	-	-
Steam cost [USD]:	233.04	-	-	-	46.39	186.65	-	-
Gas consumption [m³]:	821.98	-	135.49	91.11	87.53	352.17	-	155.69
Gas cost [USD]:	435.65	-	71.81	48.29	46.39	186.65	-	82.52
CO_2 (Electricity) [kg]:	10.84	3.3	1.49	0.22	1.19	0.92	3.3	0.44
CO_2 (Heating Energy) [kg]:	1602.86	-	264.2	177.66	170.68	686.73	-	303.59
Total CO_2 [kg]:	1613.7	3.3	265.69	177.88	171.87	687.64	3.3	304.03

Conventional processing is long due to ::

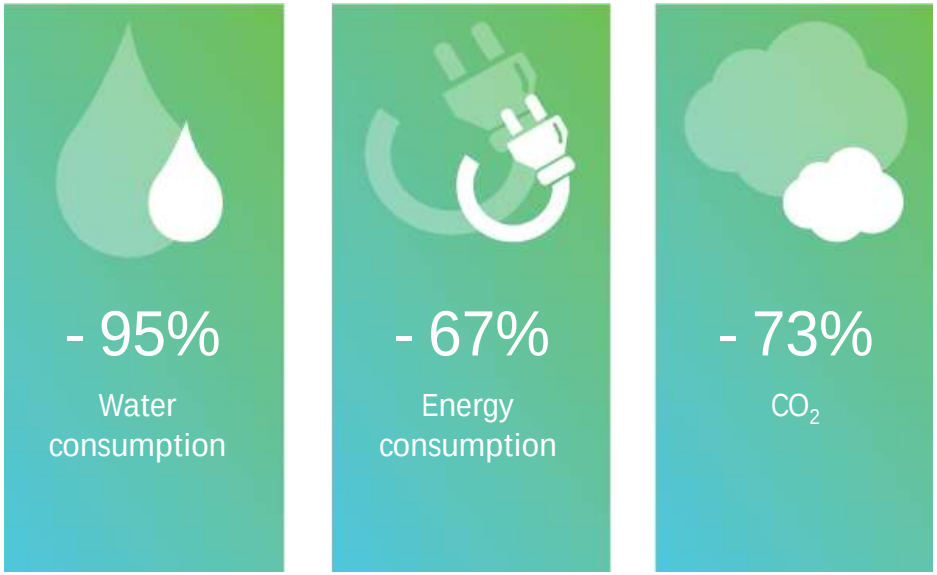
- Low formaldehyde systems which requires post washing and drying
- Subsequent application of handle modifiers which requires additional steps

Fixapret Resin WFF process



Total values				
Time [min]:	555.56	555.56	555.56	555.56
Water consumption [l]:	2600	2600	-	-
Water cost [USD]:	2.05	2.05	-	-
Electr. consumption [kWh]:	758.68	500	225.6	33.08
Electricity cost [USD]:	69.8	46	20.76	3.04
Heating Energy [MJ]:	7629.22	-	4742.14	2887.08
Total Energy [MJ]:	10360.47	1800	5554.3	3006.17
Steam consumption [kg]:	-	-	-	-
Steam cost [USD]:	-	-	-	-
Gas consumption [m³]:	217.98	-	135.49	82.49
Gas cost [USD]:	115.53	-	71.81	43.72
CO_2 (Electricity) [kg]:	5	3.3	1.49	0.22
CO_2 (Heating Energy) [kg]:	425.06	-	264.2	160.85
Total CO_2 [kg]:	430.06	3.3	265.69	161.07

- Due to the “formaldehyde free” chemistry no washing off is required
- Handle modifiers can be applied in the same step
- Dramatically reduced water and energy consumption



- Peace of mind that dyes and auxiliaries are RSL/MRSL and BSSL compliant
- Formaldehyde free fabric
- Dramatically reduced water & energy usage and CO2 emission
- Conventional process = 4.6L water/M;
- Fixapret Resin WFF process = 0.26L water/M
- Less damaged fabric – higher tensile strength

Sustainability means opportunities

- Industry is facing new challenges with *push* from legislators and *pull* from brands and consumer - demand for complete new approaches to manufacture and application of colorants
- Colorant manufacturers need to seize the initiative and find new more sustainable ways to produce with minimal environmental impact
- Textile producers too need to embrace new coloration technologies to conserve resources and develop ecological textiles to meet the new expectations of consumers
- Market challenges opens way for new innovations in more ecological colorants, manufacturing & application technologies and in waste management

In a nutshell

Cost efficiency

Reduced water or energy consumption

Nature-friendly ingredient selection

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