Pharmafilter

General Capability Presentation, 3rd October 2017

Peter Kelly, International Director.

Agenda

- Introduction of Participants
- Introduction of Pharmafilter the Company
- General Capability Presentation
- Q&A Session

The principles of Pharmafilter®

Simpler processes within the hospital

Safer and cleaner

Faster and more enjoyable work

Cost reduction

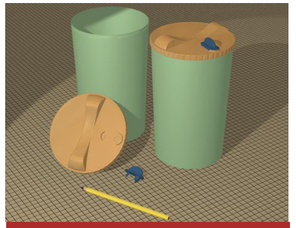
... and a cleaner world!

Working method

Olla®

Botta®

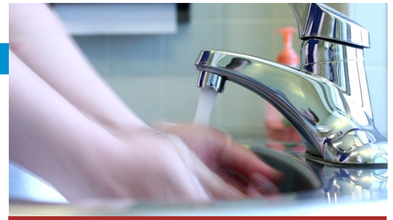
Solid waste incl. Healcare risk waste



New products

Internal sewage

Internal sewage

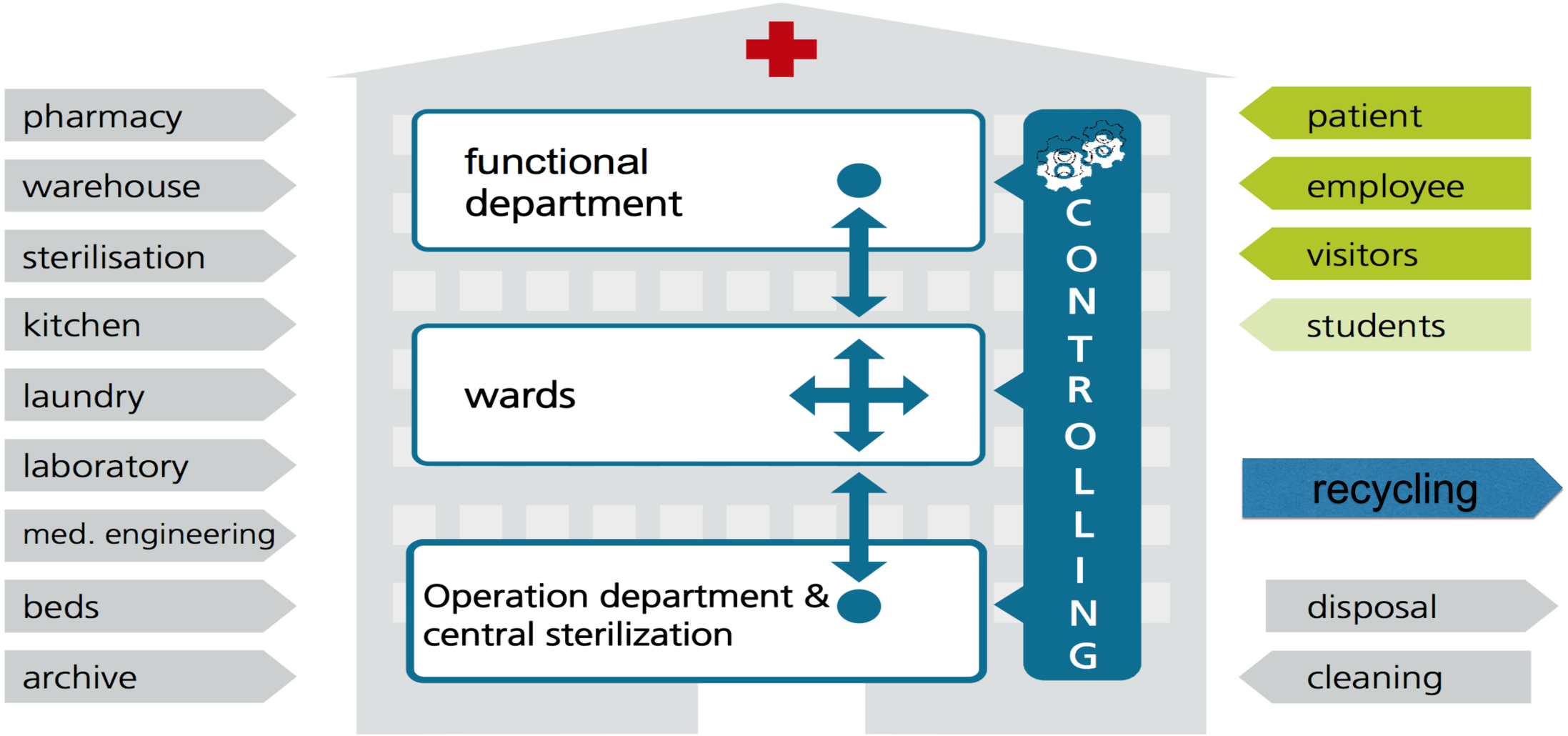


Wastewater

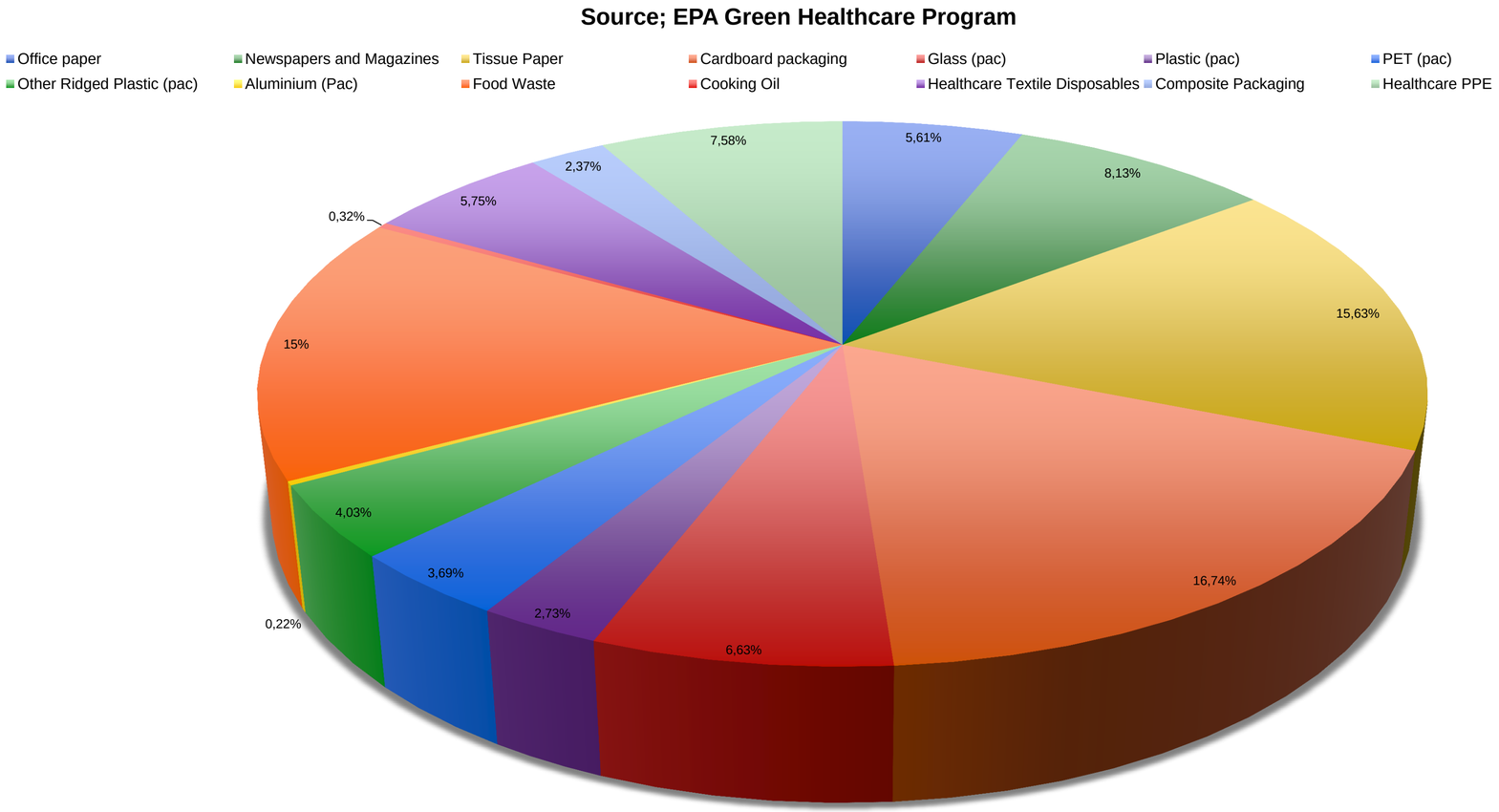
Pharmafilter installation

Logistical flows in hospitals

Pharmafilter



Hospital General Waste Profile



Pharmafilter

OPTIONAL
BIOPLASTIC
SINGLE USE BEDPAN

ADVANCED
SHREDDER UNIT

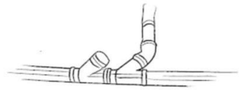
All Hospital Waste
into Shredder Units
Disposal & Treatment

All Hospital Wastes

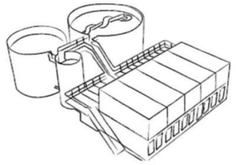
Colour	Description
Yellow	**Waste which requires disposal by incineration** Indicative treatment/disposal required is **incineration** in a suitably permitted or licensed facility.
Orange	**Waste which may be "treated"** Indicative treatment/disposal required is to be "rendered safe" in a suitably permitted or licensed facility, **usually alternative treatment plants (ATPs). However this waste may also be disposed of by incineration.**
Purple	**Cytotoxic and cytostatic waste** Indicative treatment/disposal required is **incineration** in a suitably permitted or licensed facility.
Yellow/black	**Offensive/hygiene waste*** Indicative treatment/disposal required is **landfill** or municipal **incineration/energy from waste** at a suitably permitted or licensed facility.
Red	**Anatomical waste for incineration†** Indicative treatment/disposal required is **incineration** in a suitably permitted facility.
Black	**Domestic (municipal) waste** Minimum treatment/disposal required is **landfill**, municipal **incineration/energy from waste** or other municipal **waste treatment process** at a suitably permitted or licensed facility. Recyclable components should be removed through segregation. Clear/opaque receptacles may also be used for domestic waste.
Blue	**Medicinal waste for incineration†** Indicative treatment/disposal required is **incineration** in a suitably permitted facility.
white	**Amalgam waste** For **recovery**

Tonto®

Existing Hospital
Sewerage Systems

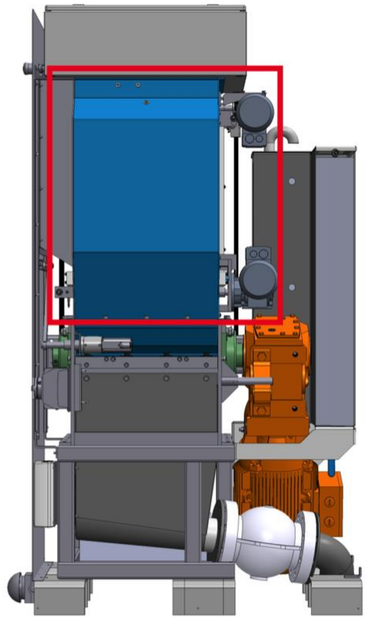


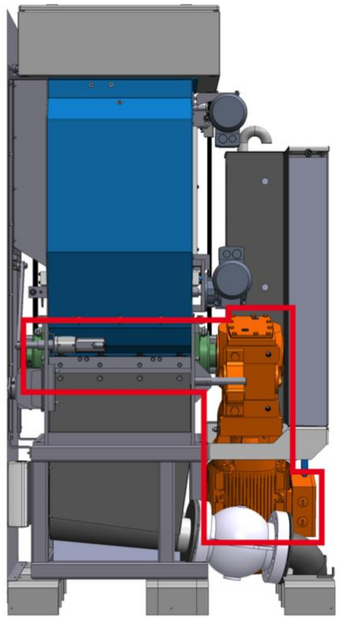
On Site Waste
Treatment Plant

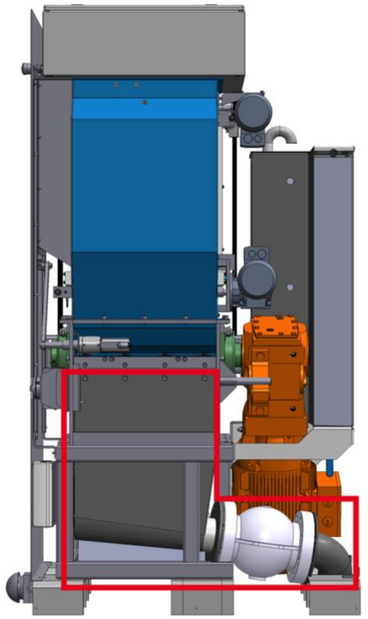


Reinier de Graaf Hospital, Delft, Holland

- **Cleaner, more efficient work processes.**
- **Reduced risk of hospital infections**
- **Improved Hygiene for staff & patients.**
- **Reduced waste management costs.**
- **Reduced or eliminated water discharge costs.**
- **Purification of Hospital hazardous/biohazard waste.**
- **No bio-toxins into water/sewerage system.**



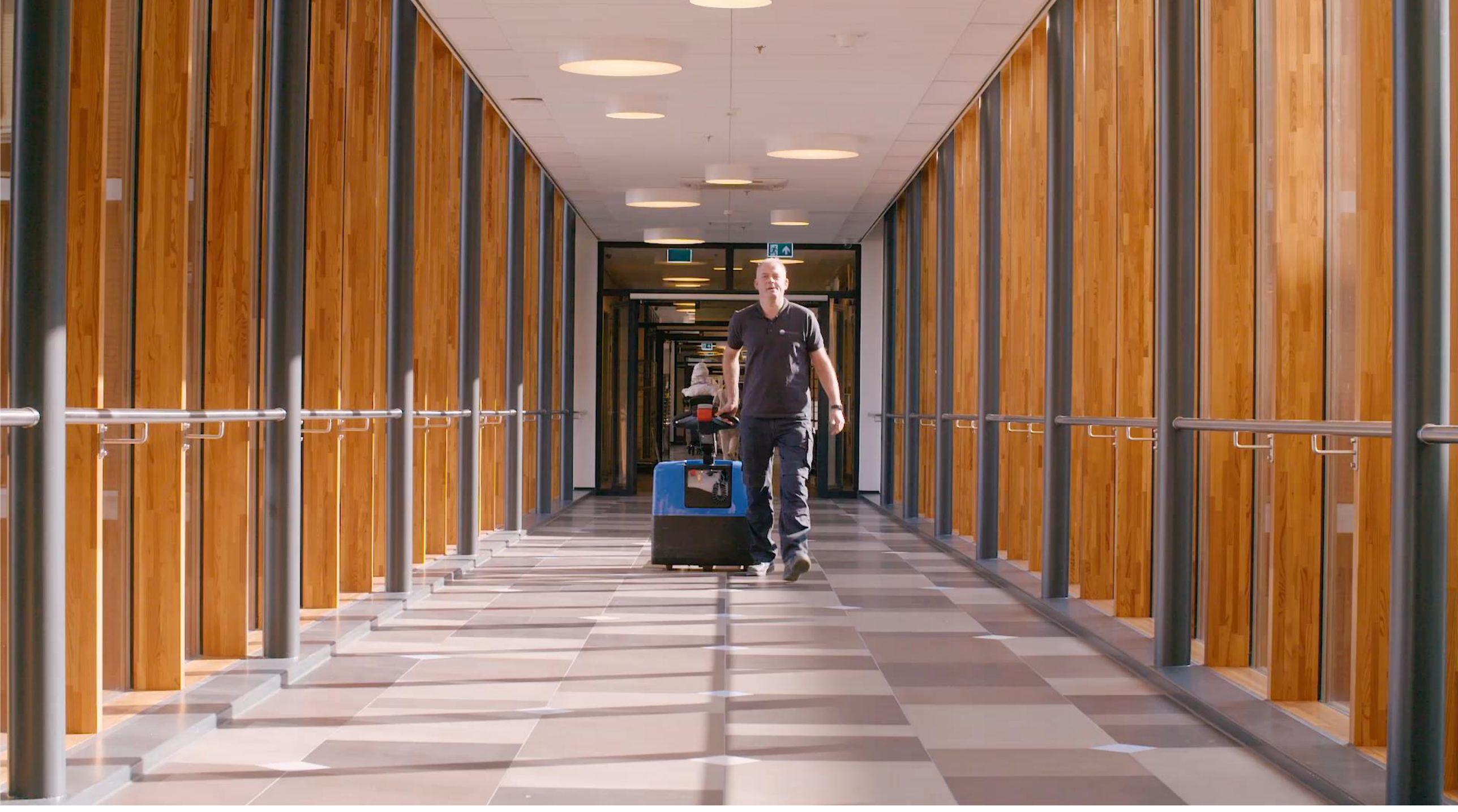




40 min change out
Plug & Operate
Cold Water feed
3 Phase
Internet Remote
Monitoring

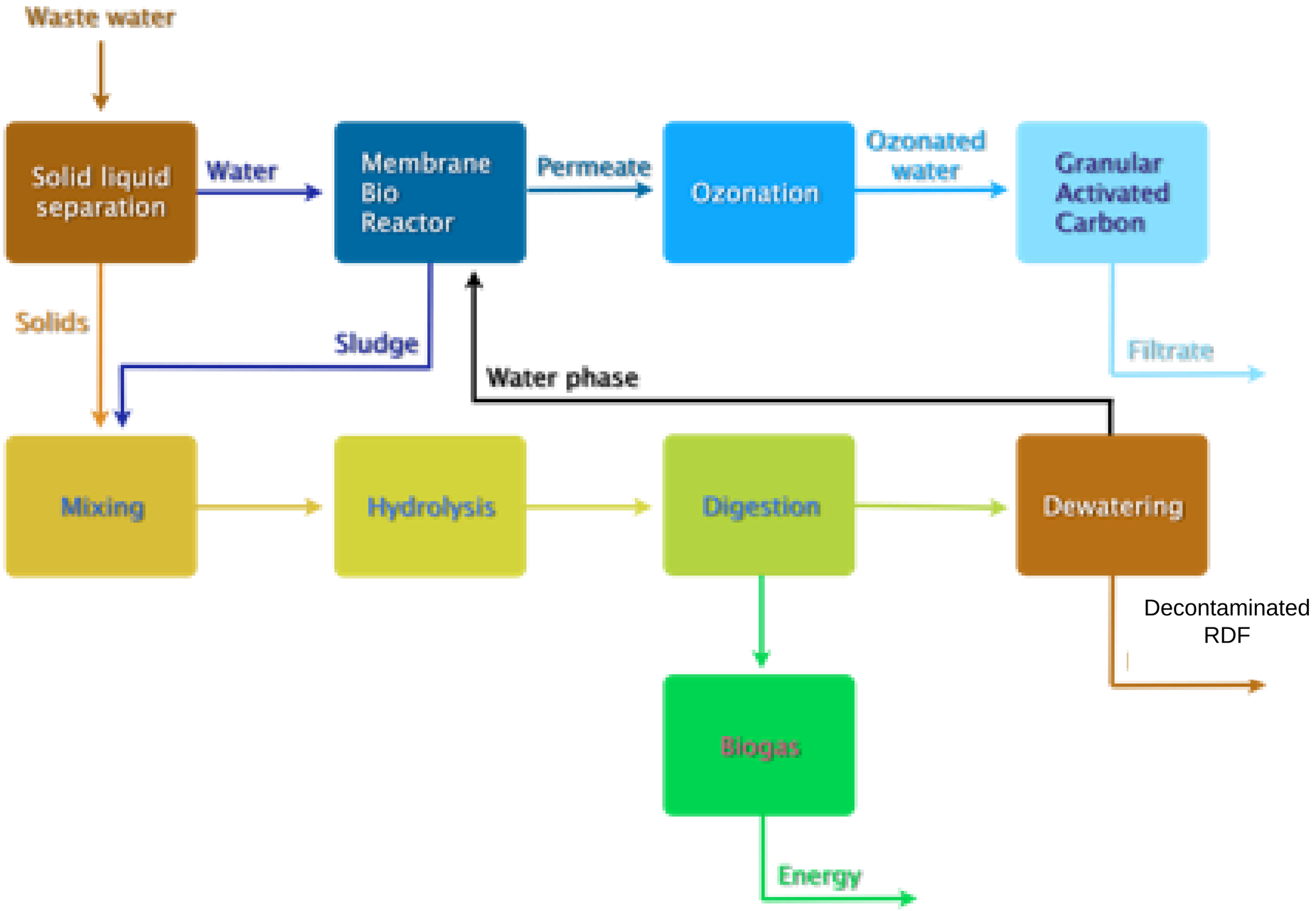
Tonto 3 Sluice Room Shredder

Pharmafilter



Waste digestion and water purification
= hazardous substance elimination

General FLow Diagram



Performance In-Situ

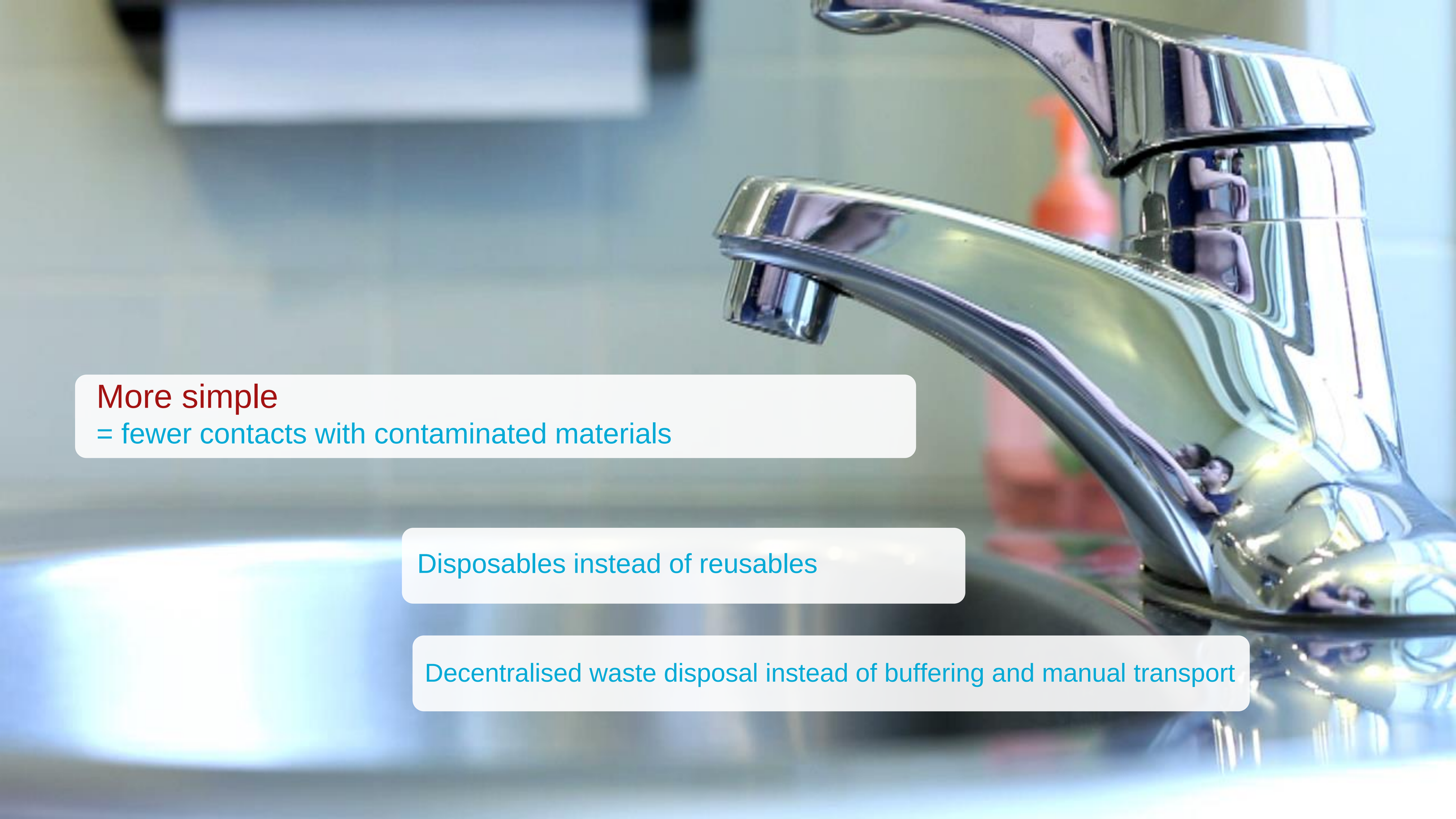
Reinier de Graaf Groep

Savings in Waste-logistic from nursery-wards: 100%

Savings in pollution tax: 99,9%

Savings in Waste transportation 50%

Recycling of water: till now 50%



More simple
= fewer contacts with contaminated materials

Disposables instead of reusables

Decentralised waste disposal instead of buffering and manual transport

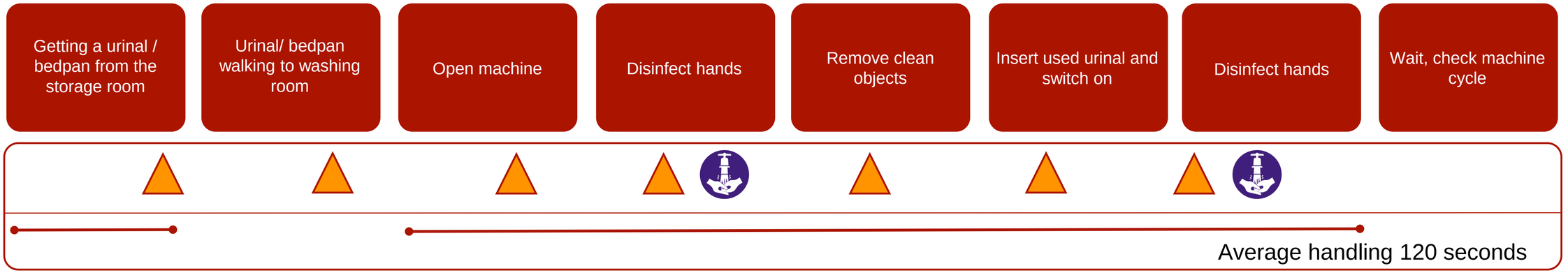

Dagverpleging

More simple
= inherently more hygienic

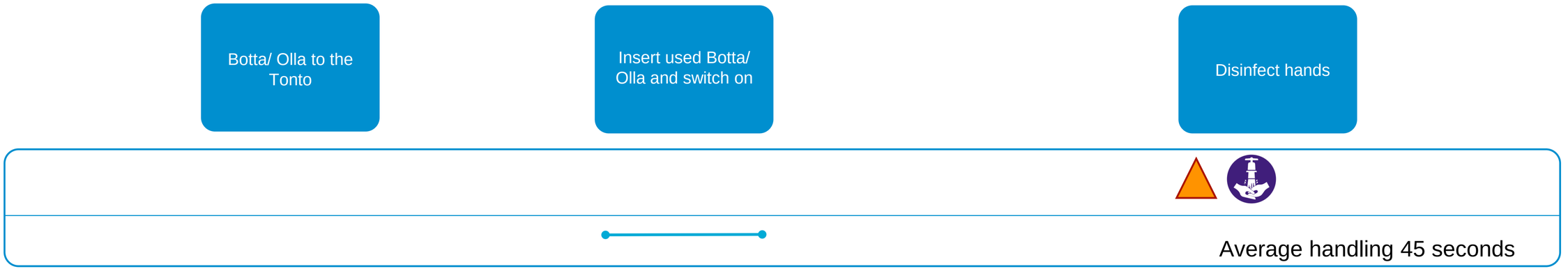
Reinier de Graaf Groep

Patient asks for urinal or Bedpan

Protocol urinal/ bedpan



New protocol Botta/ Olla



Risk of cross contamination

Hand disinfection

Source: Observations on the wards of internal, women & child, cardiology & surgery

Source: Protocol hand disinfection: 30sec. Washing hands and 10sec. drying

Pharmafilter

Disposables
= cleaner and more efficient

Olla®

Pharmafilter

Urinal; once per 24 hours

Odour free
Non-Drip

Disposables
= cleaner and more efficient

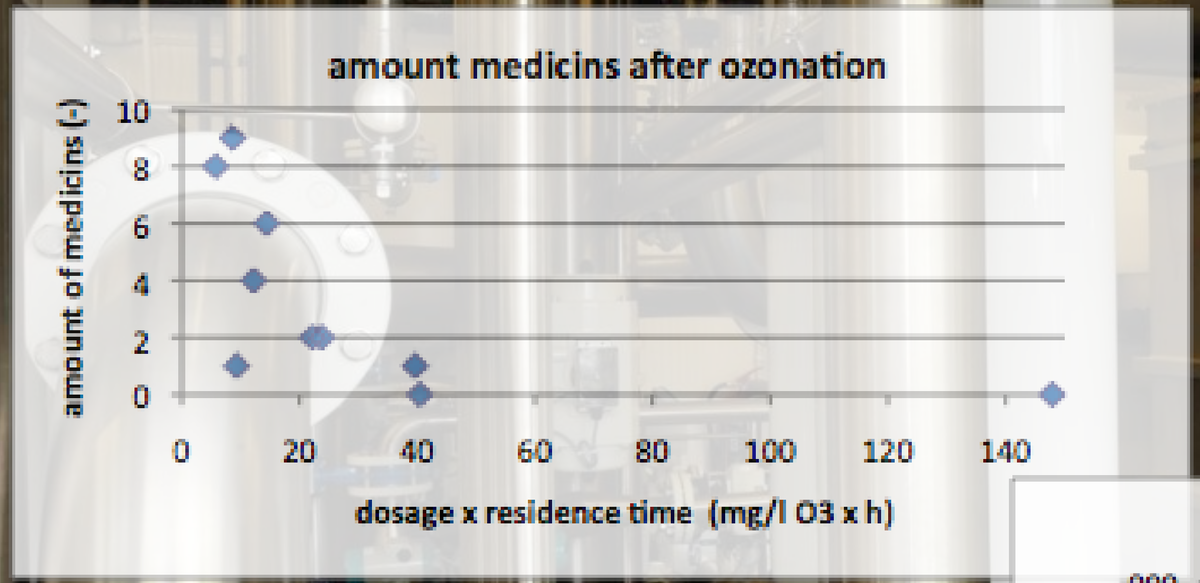
Botta®

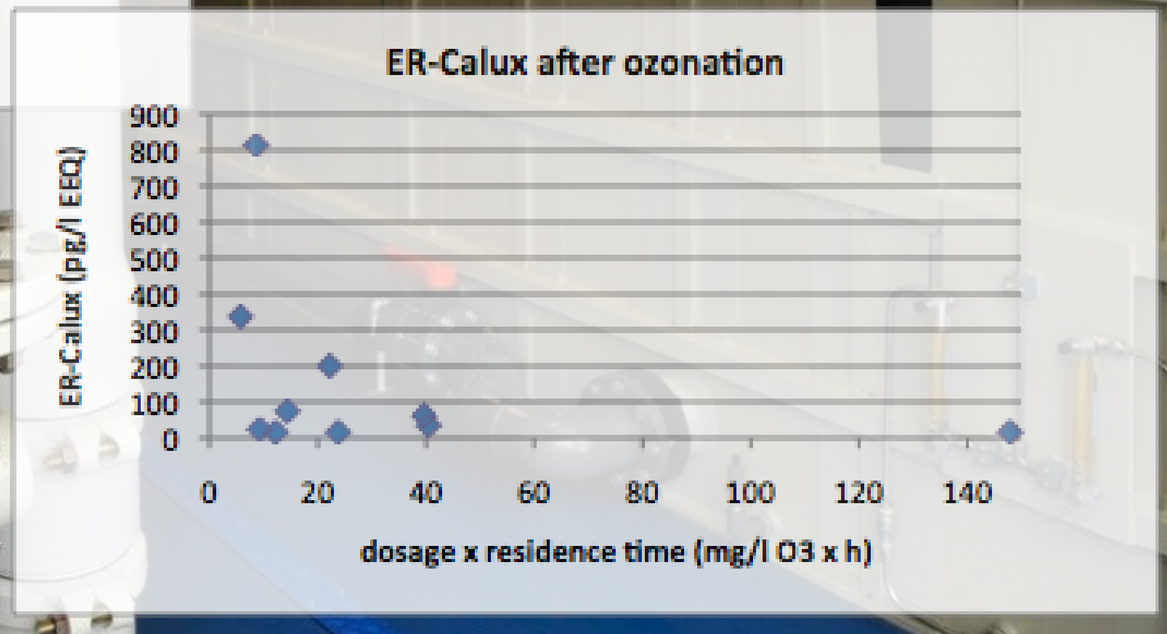
Advanced Waste & Wastewater Treatment Developed for Healthcare… By Healthcare!

Water purification

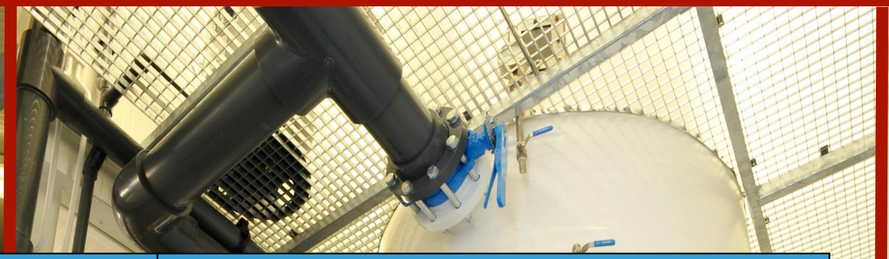
= removal of all hazardous hospital-originating substances

Ozonisation important step





Removal after full treatment



	Influent	Effluent
Chemical Oxygen Demand	1235 mg/l	99.8 %
Biological Oxygen Demand	205 mg/l	99.6 %
Total P	32 mg/l	83.8 %
Total N	125 mg/l	88.1 %
Ammonium as N	37 mg/l	99.8 %
Kjeldahl nitrogen as N	114 mg/l	99.8 %

Microbiological research for recycling water

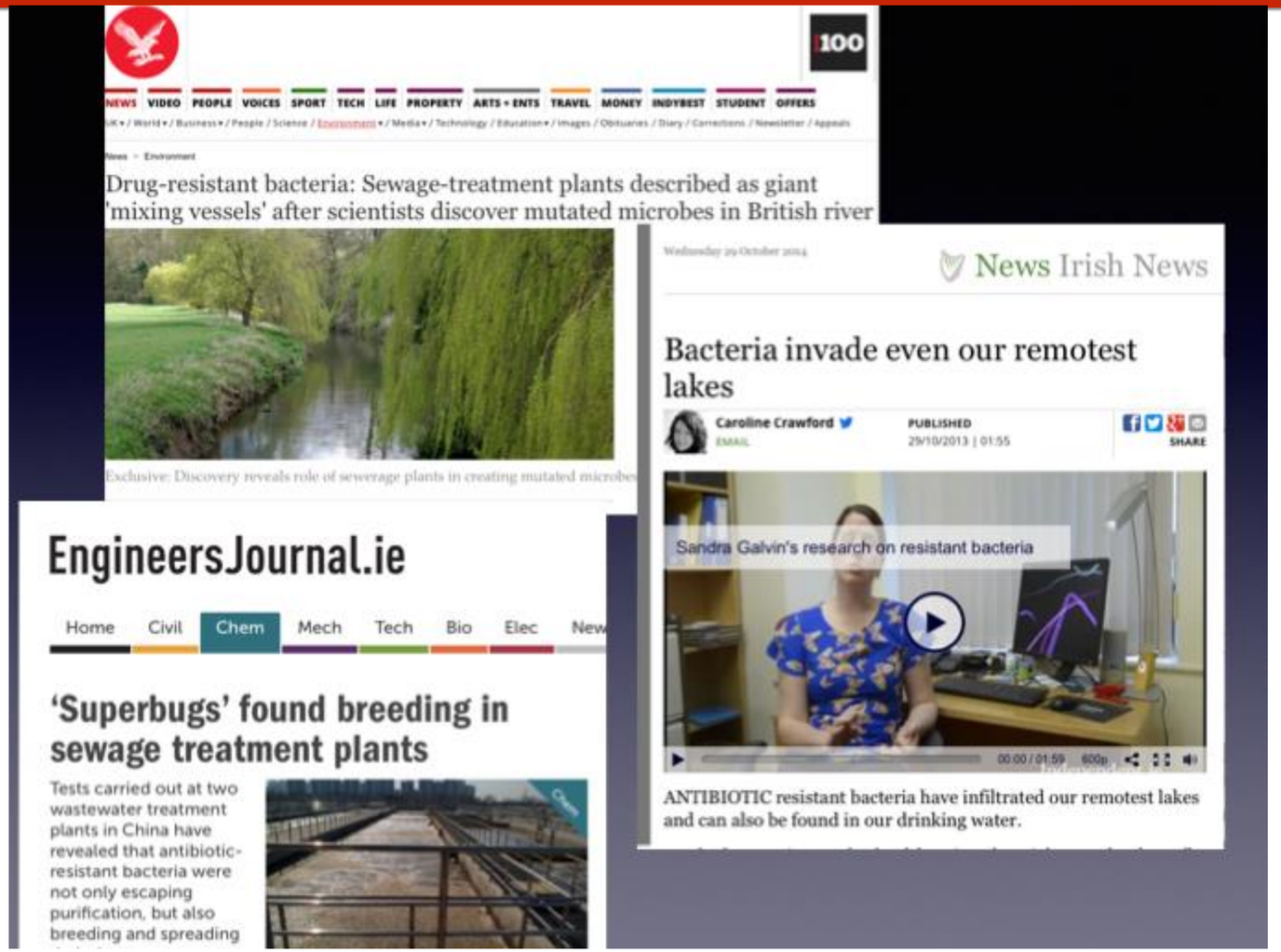
Parameter	Influent	Effluent
Coliforms 37°C	40.000-680.000	0
E-Coli	40.000- 80.000	0
th.tolerant ecoliforms 44°C	30.000-480.000	0
CFU 36°C	330.000-3.100.000	30-2000
CFU 22 °C	600.000-4.000.000	60-1400
Faecal streptococci	40.000-190.000	0
Pseudomonas aeruginosa	500-4000	0
Enterococci	15.000-400.00	0
Legionella	<250-500	< 100

Hospital Originating Contamination

KPC-2 and OXA-48 carbapenemase-harbouring Enterobacteriaceae detected in an Austrian wastewater treatment plant.

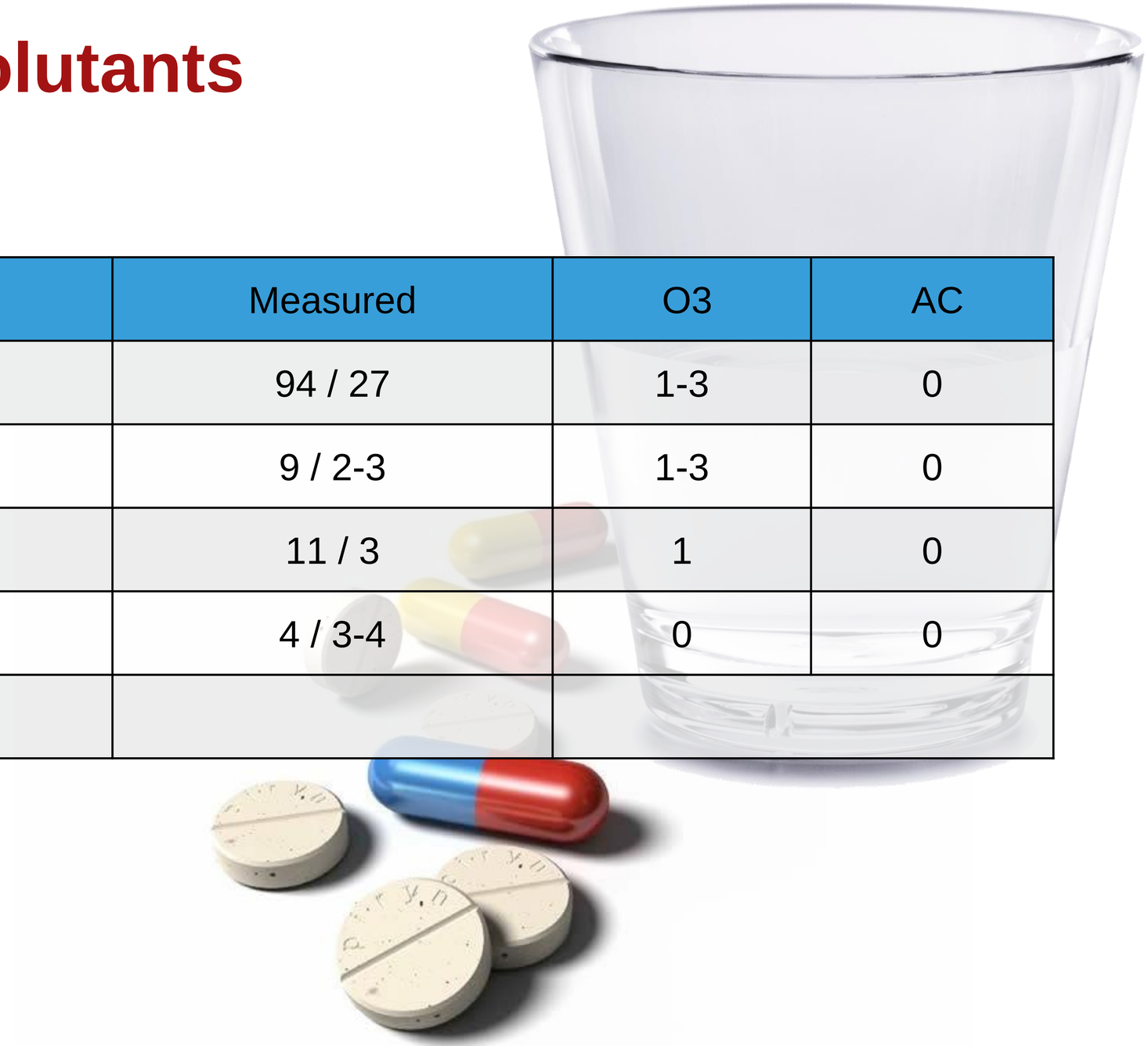
Multiresistant Enterobacteriaceae, like carbapenemase-producing strains, have their primary reservoir in medical institutions. They can also be found with increasing tendency in other reservoirs. One possible way for entrance of multiresistant Enterobacteriaceae into the environment is via waste water. The aim of the study was to screen isolates from a wastewater treatment plant for the presence of carbapenemase-producing Enterobacteriaceae. Three isolates harboured carbapenemase genes, one Klebsiella pneumoniae harboured KPC-2 and one K. pneumoniae and one Escherichia coli harboured OXA-48. This is the first report of carbapenemase-harbouring Enterobacteriaceae isolated outside medical institutions in Austria and the first detection of KPC-harbouring K. pneumonia MLST ST 1245.

Increasing Awareness



Removal of Micropolutants
= feasible at last

	Measured	O3	AC
Pharmaceuticals	94 / 27	1-3	0
X-ray media	9 / 2-3	1-3	0
Personal Care Products	11 / 3	1	0
AR-, ER, GR-, PR - Calux	4 / 3-4	0	0



Removal below detection limit

Type	Conc. Influent (ug/l)	Conc. Effluent (ug/l)
17-a-ethynil	<1.50	<0.50
aminoantipyr	<0.05	<0.05
azitromycine	<0.05	<0.05
bezafibraat	<0.01	<0.01
carbamazepin	5	<0.01
chlorampheni	<0.04	<0.01
clarithromyc	60	<0.05
clofibraat	<0.08	<0.02
clofibrinezu	<0.02	<0.01
cloxacilline	<0.01	<0.01
coffeine	1500	<0.05
cyclofosfami	22	<0.01
dapson	<0.15	<0.05
diclofenac	10	<0.01
dicloxacilli	<0.03	<0.01
erythromycin	<0.15	<0.01
fenazon	<0.02	<0.01
fenofibraat	<0.02	<0.01
fenoprofen	<0.01	<0.01
fenoterol	<0.10	<0.01
furazolidon	<0.60	<0.10
gemfibrozil	92	<0.01
ibuprofen	14	<0.01

Removal below detection limit

Type	Conc. Influent (ug/l)	Conc. Effluent (ug/l)
indomethacin	<0.15	<0.02
ketoprofen	<0.03	<0.01
lidocaine	27	<0.01
lincomycine	<0.02	<0.01
metoprolol	39	<0.01
monensin	<0.04	<0.01
nafcilline	<0.03	<0.01
naproxen	59	<0.02
estrone	<0.25	<0.05
oleandomycin	<0.02	<0.02
oxacilline	<0.01	<0.01
pentoxyfilli	<0.02	<0.01
primidon	<0.15	<0.01
progesteron	<0.08	<0.01
propranolol	<0.70	<0.01
rixithromyci	<0.20	<0.01
sotalol	64	<0.05
spiramycine	<0.50	<0.05
sulfachlpyri	<0.1	<0.1
sulfadimetho	<0.01	<0.01
sulfadimidin	<0.05	<0.05
sulfamethoxa	25	<0.01
sulfaquinoxa	<0.05	<0.05
trimethoprim	35	<0.02

Removal below detection limit

	Conc. Influent (ug/l)	Conc. Effluent (ug/l)
Amidotrizoic	3	< 0.01
Iohexol	19	< 0.01
Iomeprol	< 0.01	< 0.01
Iopamidol	<0.05	< 0.01
Iopanoic acid	< 0.01	< 0.01
Iopromide	3	< 0.01
Iothalamic acid	< 0.01	< 0.01
Ioxaglic acid	< 0.1	< 0.1
Ioxitalamic acid	15	< 0.01
AR kalux (ext.lab.)	66	<0.31
ER kalux (ext.lab.)	69	<0.04

Waste reduction by Thermophilic digestion

= generating energy

New infrastructure

Hospital details	% saving	excl. VAT	incl. VAT	amount	
Number of beds					
Total bed days used					*days*
Number of patients					
Average length of stay					*days*
Number of bedpan washers					

General					
Inflation (based on CPI last 10 years)					*per year*
Increase in income					*per year*
VAT					
FTE nursing and logistics					*hours per year*
Discount (Net Present Value)					

Savings on (waste)water	% saving	excl. VAT	incl. VAT	amount	
Wastewater (WVO-charge)					*m3/year*
Extra charge wastewater					*in year*
Additional WVO levy (micropollutants)					*percent*
Drinking water					*m3/year*
Drinking water saving cycle					*annualy*
Reduction in water costs (use as process water)					*percent*
Cooling tower consumption					*m3/year*

Savings on waste	% saving	excl. VAT	incl. VAT	amount	
Kitchen waste (swill)					
General waste					
- Healthcare Risk waste					
- Healthcare risk waste containers					
Healthcare risk waste total					
Saving on Healthcare risk waste					

Pharmafilter Residual Waste		excl. VAT	incl. VAT	amount	
Residual waste costs Pharmafilter					*Euro per kilo*
- Food waste (remaining)					*kg*
- General Waste (remaining)					*kg*
- Healthcare risk waste (remaining)					*kg*
Total digested waste					*kg*
Cost after digestion					*Euro*
Reduction cycle due to the use of bioplastic v conventional					*annually*
Reduction of general waste					

Maintainence savings/(expenses)	% saving	excl. VAT	incl. VAT	amount	
Investment in Bedpan washer					*Euro*
Depreciation term for bedpan washers					*year*
Maintainence Cost bedpan washer (incl. validation)					*Euro*
Installation maintainence					*Euro*
Maintainence cost Tonto					*Euro*

Business Case Development

Site Specific description of costs and benefits

Bioplastic from waste organics

= disposables without waste

Patient commited= more efficient, hygiene, safer & enjoyable work

Olla de luxe®


Olla on the move®

Thank You

Pharmafilter

Thank you for listening

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