DALMAR
IMPIANTI

AQUA SAVE II WSR 2000

PRODUCT DESCRIPTION

Aqua Save II WSR 2000 DEC

Wiping solution preparation, recovery and treatment plant

GENERAL DESCRIPTION

Purpose of the installation

This plant has been conceived for the preparation and recycling of the wiping solution required by intaglio printing machines, based on the latest generation of the recycling system superseding all ultra-filtration membranes recycling processes.
It has been developed to perfectly suit the printing machines by maintaining the characteristics of the wiping solution. For many years this has resulted in excellent quality in banknote printing.
The Aqua Save II DEC is the only system capable of achieving a recycling rate of more than 90% without modifying the standard wiping solution formulation and thus enabling to run the printing machine with a maximal efficiency.
Recycling is obtained by means of a chemical reagent, able to separate inks without modifying the characteristics of the wiping solution.
The separation of solids, in compact form and easy to handle, is carried out by static decantation and filter press system.
The performance of the installation is guaranteed with lowest energy consumption and running cost, also due to the elimination of the expensive ultra-filtration process and relevant replacement membranes.
The quality of the recycled solution obtained by the Aqua Save II DEC system is in accordance with recommendations, as it does not compromise the performance of the intaglio machine and its parts.
This recycling system permits to comply with all worldwide environmental regulations.

Advantages

The Aqua Save II comes from a long experience in the field of wiping solution recycling by ultrafiltration (Aqua Save I).
Indeed it has been conceived to overcome a few weaknesses relating to the ultrafiltration (UF) membranes and associated costs, i.e.:

- progressive flow rate reduction
- treatment of rinsing and washing water
- troubles with inks containing paraffin, metallic pigments, etc.
- difficulty to obtain solid and dehydrated waste from the concentrate
- very expensive replacement of UF membranes.

The most significant advantages offered by the Aqua Save II DEC are the following:

- High recovery rate
- Very compact and dehydrated solid waste
- Very low consumption of chemicals
- Very reduced energy consumption
- Little request for maintenance and spares
- Good performance with any kind of ink
- Longer operating time for filter press for recovery, which will filter a solution already clarified
- Real-time production up to 3 shifts with no accumulation of used or recycled solution
- Process not affected by the presence of metallic pigments
- Independent treatment section for the small share of concentrate (<10%) in order not to affect the recycling section, also avoiding any accidental risk of chemical contamination of the recovered solution
- Possibility to treat in the independent treatment section also the waste solution occasionally accumulated in the emergency overflow tank.

Recovering capacity and characteristics of the recycled solution

- The plant performs a recovering capacity for the used solution of more than 90%
- This factor depends upon the amount of inks contained in the used solution
- Fresh solution is required to compensate the share of liquid in the concentrate withdrawn from the bottom of the decanter; fresh solution integrations always maintain the efficiency of the wiping process
- The recycled wiping solution is perfectly clear and its quality assures the good functioning of printing machines at the maximum performance, without implying any modification to the original wiping system of printing machines.

Solid waste to be disposed

The plant generates solid waste in a dehydrated and compact form ("cakes") with approximately the following contents per cubic metre of recycled wiping solution (based on 1% ink concentration in the used solution)

- 10 kg of printing inks
- 10 kg of wiping solution (as 50% humidity in solid waste)
- 0.5 kg of reagent
- 0.5 kg of filter-aid
- Total approx. 21 kg/m^3

No treatment is required for the solid waste, which can be disposed of according to the European Waste Catalogue, Ref. 080315 (2000/532/EC) and amendments.

Liquid waste

The small share of concentrate (<10%) is automatically treated in the independent treatment section, consisting of treatment tank and filter presses.
The resulting effluent has the following main characteristics:

- pH 7.5 ÷8.5
- COD depending on the amount of organic materials contained in the wiping solution to be treated

Furthermore, an under vacuum evaporator can be foreseen as an option to give condensed water that can be drained without any further treatment and a little quantity of concentrated salty solution that could be disposed of together with the solid waste of the filter presses.

Process description

The plant is conceived to enable the following:

- Recycling of 90% of wiping solution discharged by Intaglio printing machines (spray wiping), this factor depends upon the amount of inks contained in the used solution.
- Production of 10% of fresh wiping solution as integration
- Independent treatment of the concentrate coming from the decanters
- Treatment of the solution occasionally contained in the emergency overflow tank
- Under-vacuum evaporation of the above-mentioned small share of treated solution (option).

According to the flow chart herewith enclosed the process is as follows:

- The used solution coming from the wiping process on the intaglio machines equipped with spray wiping system is at first stored in the collecting tank **TK101**; an emergency overflow tank is to be provided locally.
- The used solution is pumped to the process tank **TK102**, where also the reagent Dalsep is proportionally added.
- The processed effluent is pumped to the static decanter **D104**, from which the supernatant gradually overflows to the clarified solution tank **TK201**, while the concentrate is pumped to the storage tank **TK402** of the independent treatment section.
- A very small quantity of filter-aid Perlite is proportionally added in the clarified solution tank **TK201**, via the automatic dosing device **TK202**, before the supernatant is sent to the filter press **FP205** to eliminate any residual traces of particles.
- Once reached a proper pressure inside, corresponding to the end of cycle, the filter has to be opened for solid waste removal, while the liquid is transferred to the recovered solution storage tank **TK301** and then to the wiping solution preparation tank **TK315** through a safety cartridges' filter **FT560**.
- Slight integrations of wiping solution ingredients are automatically provided in the mixing tank by soft water from water softener **WS302** and storage tank **TK601** as well as caustic soda solution and castor oil from corresponding dosing lines.
- After automatic correction and heating, the wiping solution is pumped to the intaglio machines.

- The share of concentrate in the bottom part of the decanter is automatically pumped to the storage tank **TK402** of the independent treatment section.
- The concentrate is then transferred to the treatment tank **TK403**, where the calcium chloride and sulphuric acid are automatically dosed, together with a small amount of perlite via the dosing device **TK406**, before filtration in the filter press **FP405**.
- The treated effluent is then drained (or sent to an evaporation stage - option)
- Whenever needed, also the used solution occasionally contained in the emergency overflow tank can be treated in the treatment section of the plant, as above described.

Working capacity

The plant is synchronous with maximum capacity of 2'000 l/h.
It operates in circulatory and continuous manner, ensuring to treat 2'000 l of waste water in an hour and to supply 2000 l of wiping solution in an hour.

The plant is self-regulating and capable to fit automatically to the flow rate of solution coming from 2 Intaglio printing machines equipped with spray wiping system, i.e.:

2 x 800 l/h =	1'600 l/h
Spare capacity =	400 l/h
Max. capacity =	2'000 l/h

The plant operates in real time during the printing production hours, without requiring extra-time for processing solution accumulated in the collecting tank.

Plant composition

1. Collection of used solution
2. Ink separation
3. Filtration and storage of recovered solution
4. Wiping solution production
5. Wiping solution correction
6. Independent treatment section
7. Main electric control cabinet.

DESCRIPTION OF THE MAIN GROUPS

(ref. flow chart in attachment)

1. Collection of used solution

- Collecting tank **TK101** (capacity 4'000 l), equipped with stirrer, level controls and transfer pump to feed the process
- Emergency overflow tank TK 100 (capacity 7'500 l)

2. Ink separation

- Process tank **TK102** (capacity 5'000 l), equipped with stirrers and level controls.
- Dosing group for reagent, equipped with piston dosing pump, priming chamber, valves and flow control device
- Static decanter **D104A** (capacity 6'500 l), equipped with evacuation pumps
- Clarified solution tank **TK201** (capacity 4'000 l), equipped with pneumatic pump for filter press feeding
- Motorized screw conveyor for Perlite dosing **TK202**, with loading hopper, self-cleaning filtering unit and inverters to adjust the flow rate.

3. Filtration and storage of recovered solution

- Filter press **FP205**, equipped with 30 x PP filtering plates and cloths 600x600 made of polypropylene and with an horizontal screw conveyor for solid waste removal
- Recovered solution tank **TK301** (capacity 4'000 l), equipped with transfer pump to the correction tank
- Safety cartridges filter **FL560** with pressure switch, pressure gauge and by-pass valves.

4.5. Wiping solution production and correction

- Wiping solution preparation and correction tank **TK315** (capacity 4'000 l)
- Double water softener **WS302** with automatic regeneration system for uninterrupted service
- Soft water storage tank **TK601** (capacity 1'800 l)
- Dosing group for caustic soda solution
- Dosing group for castor oil.

6. Independent treatment section

This group permits the treatment of the share of concentrate from the bottom of the decanters.
It consists of:

- Storage tank **TK402** (capacity 4'000 l), equipped with stirrer and level controls
- Treatment tank **TK403** (capacity 6'000 l), equipped with stirrer and level controls
- Filter presses **FP405**, equipped with 40x PP plates and cloths 600x600 and with a horizontal screw conveyor for solid waste removal

7. Main electric control cabinet

The two main electric control cabinets are equipped with a centralized visualisation system connected to PLC and enabling all automatic and manual controls of the plant, alarm diagnostics included.

- Electric power installed: approx. 105 kW (80 kW heating + 25 kW recycling) + 20 kW (independent treatment)
- Electronic components: PLC ABB Advanced Controller AC500
- Electromechanical components: Möller
- Feeding voltage: 3 phase, 4 wires of 400 V ±5%
- Frequency: 50 Hz
- Computers use common operating system and communication port type RS232, RS422 standard
- Electronic control system (flat touch screen) reserve manufacture parameters, inform the machine status, warn errors of the system and instruct the measure to overcome (troubleshooting)
- Manufactured in accordance with European standards EN 60204-1
- Interconnection with the existing control cabinets for the items reused for the upgrade.

Layout configuration

The Aqua Save II plant is supplied in pre-assembled modules ready to be placed.
A suitable layout configuration can be provided on the basis of the available areas at customer's site.

Operational staff to run the plant

The following personnel are foreseen to run the Aqua Save II:

- 1 - 2 operators per shift full time to supervise the process, to fill the chemicals and to remove the solid waste
- 1 maintenance technician part-time (when needed).

Raw materials consumption

(conventionally referred to the m^3 of waste solution coming from the intaglio machines)

Dosage	Caustic soda solution	1 l/m^3
	Castor oil	0.2 l/m^3
Recycling	Reagent Dalsep CWL-76 (*)	0.5 l/m^3
	Filter-aid Perlite (**)	0.2 kg/m^3
Treatment	Filter-aid Perlite (**)	0.5 kg/m^3
	Calcium chloride solution	5 l/m^3
	Sulphuric acid solution	1 l/m^3
Energy	Electric consumption (for recovery)	2 kWh/m^3
Consumables	Filtering cloths for filter press	1 set/year

(*) The reagent is a slightly acidic liquid (pH 3÷4), odourless and supplied in plastic drums of 220 litres each. It is neither toxic nor harmful and can be handled without special precautions. First load supplied, later on the product can also be purchased locally.

(**) The filter-aid is an inert white powder, supplied in bags of 14 kg each. It is neither toxic nor harmful and can be handled without special precautions. First load supplied, later on the product can also be purchased locally.

When estimating the total consumption per year, proper diversity factors should be applied.

DESCRIPTION OF THE SUPPLY

Construction materials and certificates

- Process tanks: stainless steel AISI 304
- Piping: PVC (PN16) and galvanized steel
- Certificate: declaration of CE conformity in compliance with the Machine Directive 2006/42/EC and amendments
- Dosing pumps: piston dosing pumps made in PVC and stainless steel
- Transfer pumps:
  - volumetric pumps for used solution
  - stainless steel centrifugal pumps for clean solution
  - pneumatic membrane pumps, electronically controlled, for filter press feeding
- Level controls: analogue level controls by pressure transducers connected to the touch screen for set point adjustment and volume display in litres.

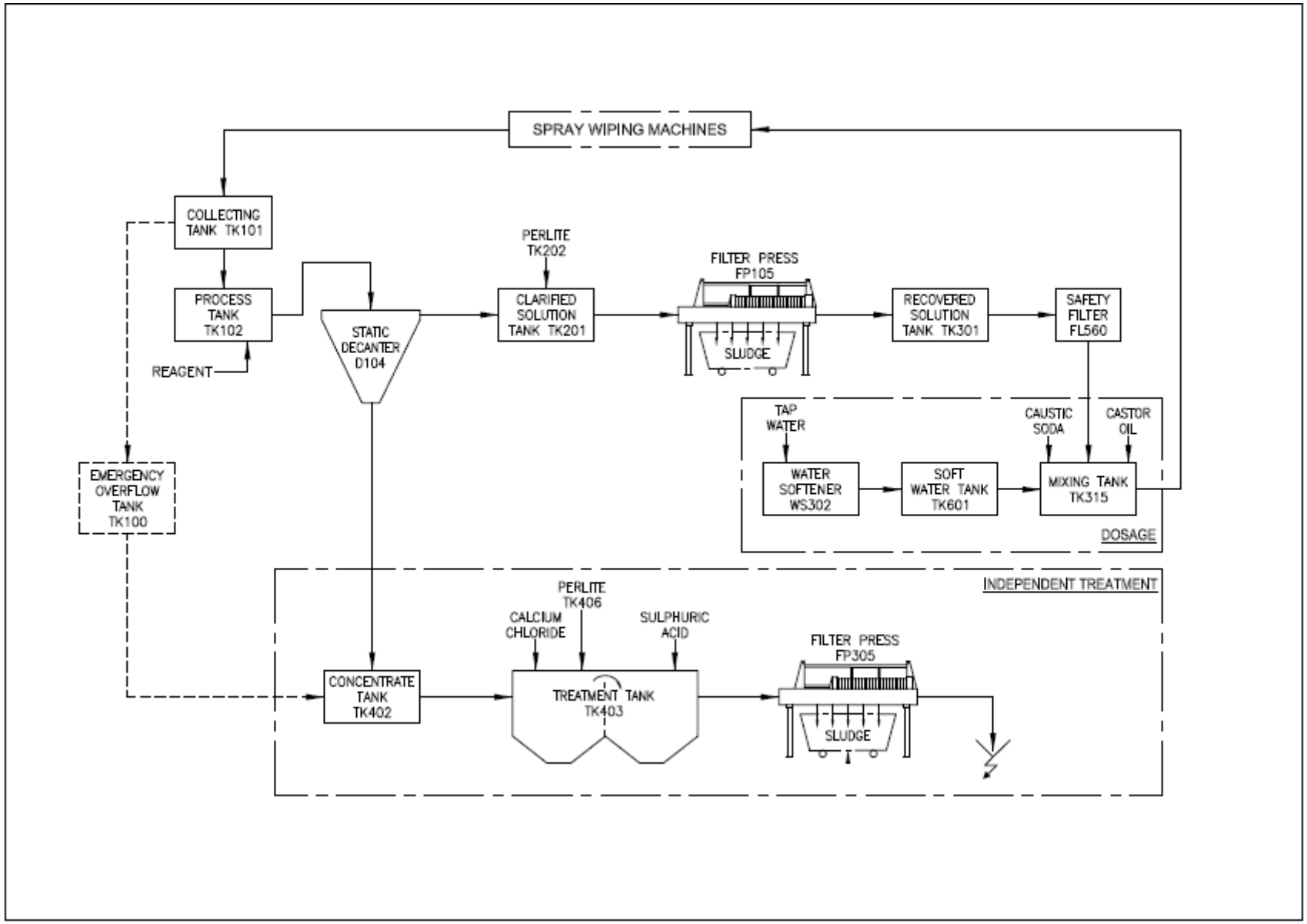
Items included in the supply

- Pipes, cables, trunking, etc. required for the interconnection of the various groups within the site of the plant
- Set of commissioning spares
- Laptop PC for programs loading etc.
- Chemicals for test run and 6-month production on 1 shift:

Reagent (in drums of 220 l each)	880 kg
Filter-aid (in bags of 14 kg each)	1'680 kg
Caustic soda solution	2'700 kg
Sulphonated castor oil	600 kg
Calcium chloride solution	700 kg
Sulphuric acid	1'200 kg
Salt for water softener	200 kg

Items not included in the supply

- All masonry and floor finish works
- Lifting and handling equipment
- Main city water line
- Main electric power supply lines
- Free pressure city drain
- Containers for sludge removal
- Compressed air line
- Chemicals for running the plant.


SPRAY WIPING MACHINES
COLLECTING TANK TK101
PROCESS TANK TK102
REAGENT
STATIC DECANTER D104
PERLITE TK202
CLARIFIED SOLUTION TANK TK201
FILTER PRESS FP105
SLUDGE
RECOVERED SOLUTION TANK TK301
SAFETY FILTER FL560
TAP WATER
CAUSTIC SODA
CASTOR OIL
WATER SOFTENER WS302
SOFT WATER TANK TK601
MIXING TANK TK315
DOSAGE
EMERGENCY OVERFLOW TANK TK100
INDEPENDENT TREATMENT
PERLITE TK406
CALCIUM CHLORIDE
SULPHURIC ACID
FILTER PRESS FP305
CONCENTRATE TANK TK402
TREATMENT TANK TK403
SLUDGE