

OPTIMIZATION OF WIRE SECTION CLEANING AND VENTILATION

Web breaks, paper defects and cleaning time as bottlenecks originated in wet end

Several significant bottlenecks and runnability problems are originated in forming section as a result of high pressure wire cleaning showers. The hp-showers are used to flush away small particles like fibers and fillers that gradually reduce the permeability of the wire, causing stripes, marking and reduced dewatering. A negative effect of the high pressure cleaning is, however, that a lot of mist is created. This mist follows the fast running wire and spreads to the surrounding area of the wire section. Because the mist consists not only of water, but also fibers and fillers, it gradually contaminates headbox, forming section frames, save alls, doctor frames and generally all devices installed cross the machine.

Especially in high speed paper machines the air is following the wire with a high speed and therefore the mist is transported very effectively to the whole area. In addition, the modern machines are using double or triple layer fabric construction, which means that the amount of water bouncing back from the wire is increased as the needle jets cannot easily penetrate the thick wire. In this case efficient fabric cleaning may need special devices to maintain the required cleanliness or desired permeability level.

As a result of the contamination on the head box, frames, save alls and hp shower pipe there is a risk that the fiber and filler lumps drop back to the wire or the paper web causing paper quality problems such as holes, paper faults, web breaks or even wire damage.

At the same time the mist has a negative effect on air state of machine hall. Due to the mist there is an increased demand on ventilation. The mist makes the air very humid worsening the working conditions for the operators. The moisture causes corrosion on frames, steel constructions and the crane as a result of condensation. It is also obvious that disturbance may be caused to the electrical systems and instruments because of high humidity level and condensation.

The volume of water created by the hp-shower in the hall air is amazingly high: in a forming section of big paper machine up to 90000 m³ of water (3 litres/second) plus fibers and fillers per year can be spread to the air if 30% of the hp-shower water is bounced back from the wire. This huge amount of water could be saved if all the mist could be removed with a modern mist removal technology and returned to water circulation.

Fibers and fillers in the save alls also start to grow bacteria in high temperature and moist conditions. If these bacteria are returned to the process they can cause slime and additional paper quality and runnability problems. It is also possible that slimy lumps drop back to the wire creating sticky conditions, which clog the forming fabrics. As a result dewatering is reduced, in turn meaning holes, spots, marking and profile problems.



Picture 1. Mist from hp-shower can be easily seen at this paper machine

Special ventilation technology contributes also to wire cleaning

EV Group has solved the mist contamination problem by designing a special technology to evacuate mist created by the hp shower (EV Mist Removal System™, EV MRS™). It is essential that the technology does not only eliminate the mist, but also assists in wire cleaning thus meaning less need for forming section cleaning and reduced number of web breaks (time loss).

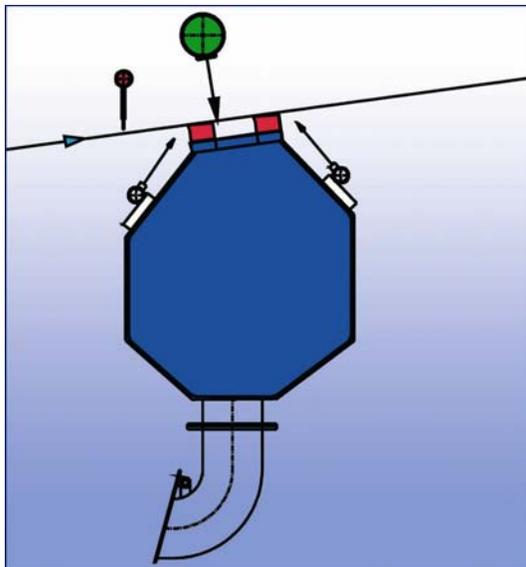
The main part of the EV MRS™ technology is the mist suction box, which evacuates the mist caused by the hp-shower and simultaneously cleans the forming fabric full width. In addition to these main functions, a lot of attention has been paid to handling the evacuated mist in the most economical way. Therefore this system includes an exhaust duct leading from the suction box to the preseparator for primary separation of water, fibers and fillers. As a final part of the system there is a centrifugal fan (EV Blower™).

The mist suction box can be adapted to different forming section types: fourdriniers, top formers and gap formers. The operation principle of EV Group's technology for different PM-positions is similar with only minor modifications.

Mist suction at top former position

The mist suction box is installed under the top wire at the point where the high pressure shower hits the wire. The suction box is equipped with ceramic foils to allow wire contact without wire damage. Additionally, the ceramic foils simultaneously clean the fabric. There are also lubrication showers on both sides of the suction box to keep the ceramics wet in all running conditions, prevent fiber contamination and re-wet the fabric to create full width foil shower for fabric cleaning.

An air doctor (knife) is mounted on the frame ahead of the vacuum slot of the suction box. The air doctor optimizes the operation of the suction box and the top frame is equipped with a perforated shower pipe to keep the doctor clean. The air doctor is easily removed for wire change.

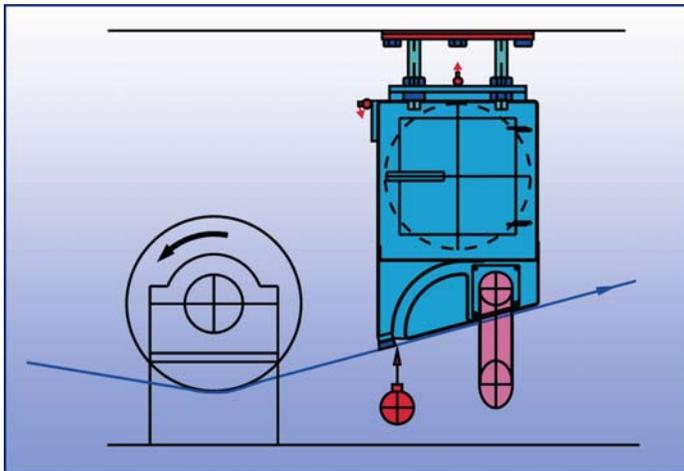


Picture 2. Mist suction box for top formers

Mist suction at the bottom wire position

On the suction box for the bottom wire there is a lubrication shower above the box. This shower is very essential because it keeps the box wet and prevents the contamination on the box located above the wire.

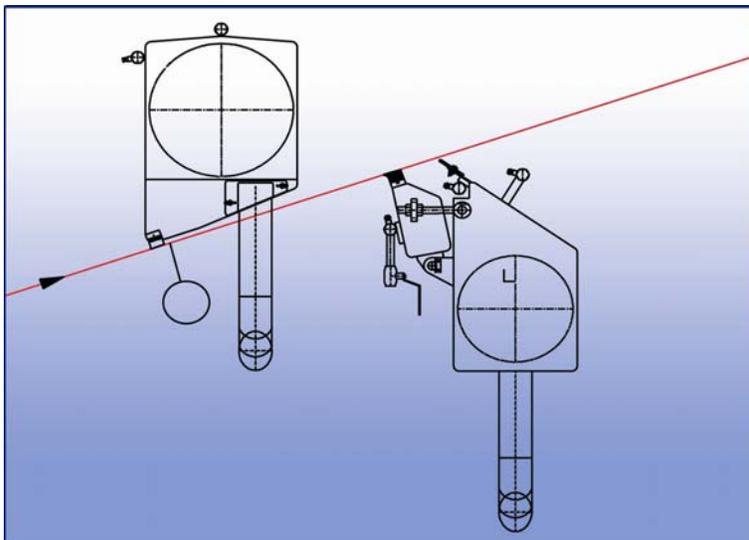
An exhaust duct is connected to the suction box and leads to a preseparator on the backside of the wire section. From the preseparator air is led through ducting to the separator fan (EV Blower™). This fan is a special construction that combines a centrifugal fan and an efficient water drop separator. By means of the fan the residual water and fiber fluid is separated from the exhaust air so that the outgoing air does not include any water drops.



Picture 3. Mist suction box for the bottom wire

Mist removal for gap formers

Gap formers need always a special construction for mist suction boxes. Installation and especially dimensioning are very important due to high PM speed and modern construction of the forming section itself.



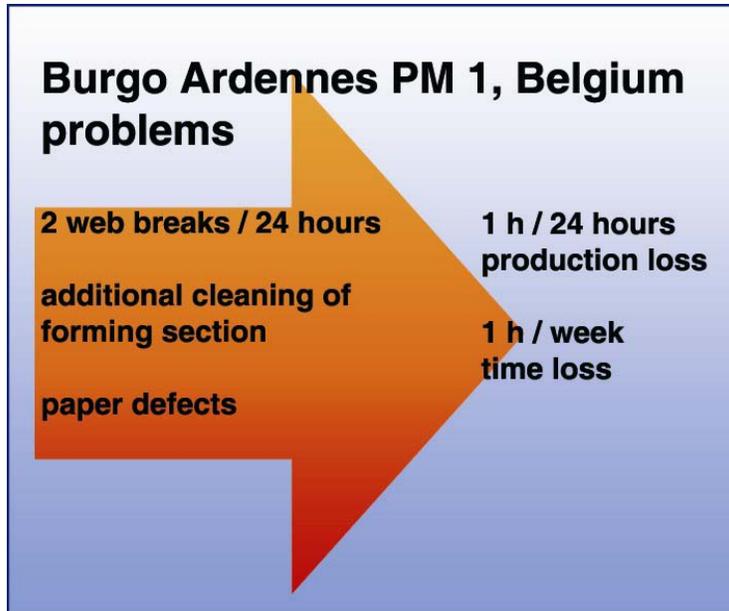
Picture 4. Mist Removal wire cleaning technology for gap formers

Anyway, according to the experience of EVG's installations at gap formers, this technology operates and also gives excellent performance up to speed of 1600 m/min. Single and twin ceramic boxes for the gap formers are used depending of age and type of the forming section. Applications for gap formers are adapted from top and bottom wire solutions.

Case Burgo Ardennes

For example in Burgo Ardennes Virton mill PM1, Belgium had 2 web breaks per 24 hours originated from the forming section. Furthermore, paper defects caused problems at mill's customers' printing machines. Because the forming fabric cleaning system with hp-showers caused a huge amount of mist, the personnel had to perform an additional cleaning of forming section once a week which took 60 minutes per week.

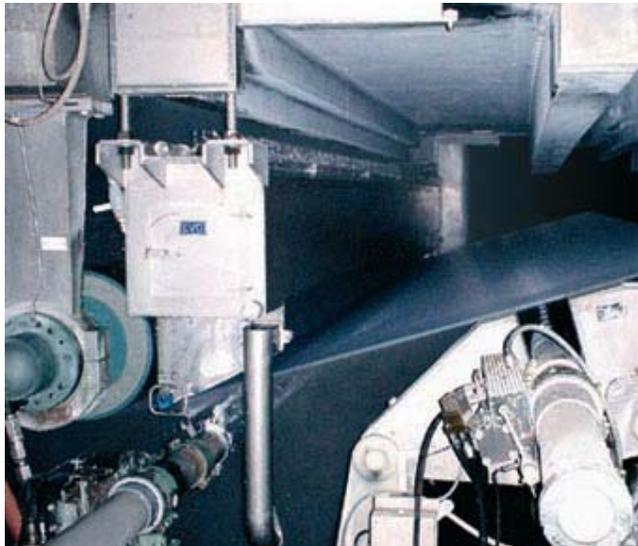
The biggest problem was the web breaks coming from wet end causing one hour production loss per day. The total production loss time per day was 101,6 minutes a day.



Picture 5. Production bottlenecks at Burgo Ardennes

Results in Burgo Ardennes

The installation included two suction boxes for the bottom and top formers, the separator fan with exhaust ducts, and water preseparator.



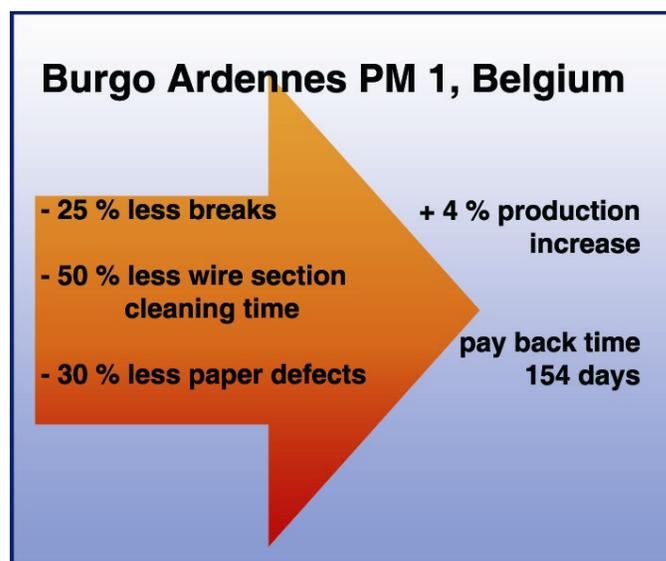
Picture 6. Mist removal wire cleaning technology at Burgo Ardennes PM1 bottom wire, speed after rebuild 1050 m/min

After the suction box the whole area is dry and nothing is allowed to drop to the wire. This means that the mist consisting of water drops, fibers and fillers is prevented from contaminating the save all, machine frames, platforms and head box. Elimination of humid air from the shower area also significantly improves machine hall air quality. There is less need for wire section cleaning and fewer web breaks do occur. After the suction box the wire is dryer which means improved dewatering and thus higher dry content after forming section; improved runnability and reduced energy consumption.

In Burgo Ardennes mill the improvement of wire section ventilation had following results:

- Breaks originated from forming section were reduced by 25 %
- Wire section cleaning time was reduced by 50% from 60 minutes to 30 minutes a week
- Paper defects such as holes and spots were reduced by 30 %.
- Total efficiency increased from 81% till 84%
- Time efficiency increased from 85% till 87%

These results increased the production time 30 minutes every day. It could be estimated that the investment pay-back time was about 154 days due to the increased production capacity.



Picture 7. Results of mist removal wire cleaning technology at Burgo Ardennes PM1

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