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MODERNIZATION CHEMICAL FEED SYSTEM AT THE PM7 “PPM” KAMA” LTD. ECONOMIC EFFICIENCY ASSESSMENT.

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The article describes the features and operating principle of TrumpJet Flash Mixing technology from Wetend Technologies Ltd, Finland. The comparative statistical data of the paper machine №7 on the "PPM" KAMA" LTD with the chemical feed system TrumpJet and without it. Made a comparative analysis efficiency of modernization the chemical mixing system.

Keywords: paper, fiber retention, chemical dosing, TrumpJet

Purpose and objectives

The purpose of modernization - is to reduce the specific chemicals consumption (polyacrylamide, micro-polymer, starch, AKD) with saving of mechanical paper quality, (fiber and filler retention, formation, strength and sizing), subject successful performance paper machine.

Elimination fresh water consumption for the chemicals dilution and transportation to the dosing point.

The set of works on modernization included the solution of several problems:

1) Development and coordination of project documentation;
2) Installation of new equipment: mixers, boosting pump, pressure and flow sensors. Tie-in into the operating collector after pressure screen with machining of the surface;
3) Execution of range technical measures, adjustment process control system for the required operating/washing modes;
4) Commissioning system with the selection dosages of chemicals without impairing the quality products.

5) Implementation of a guarantee. Analysis of economic and quality indicators after commissioning TrumpJet system.

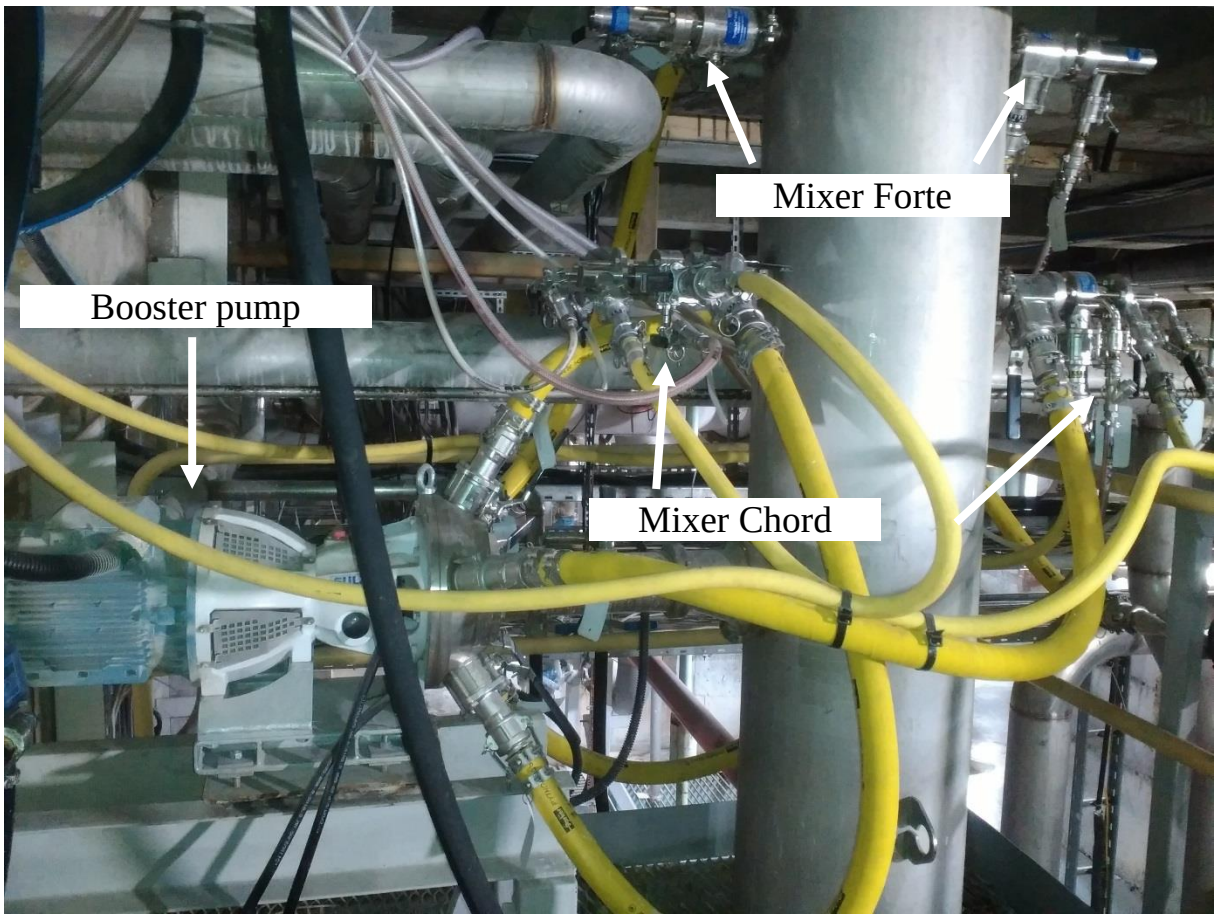
Description chemicals feed system on the PM7 before and after installation TrumpJet system.

Picture 1 shows a typical system for the supply of retention chemicals (polyacrylamide and micro-polymer) operating on PM7 before upgrading.

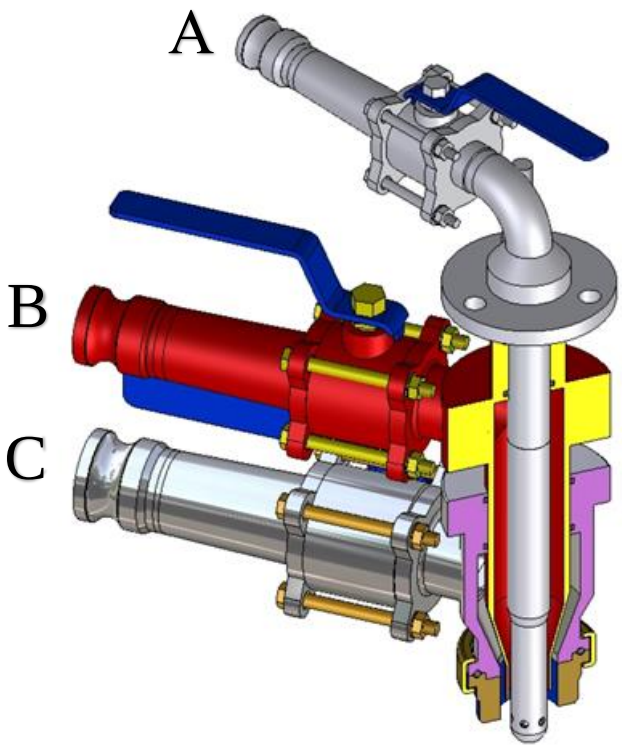
Picture 1 – Chemical feed system for retention on PM 7

Polyacrylamide was fed into the distribution ring in front of the pressure screen and through 4 nozzles fed to the stock flow. Micro-polymer was fed into a similar distribution ring, but after screen. Cationic starch was fed to a mixing chest POMix, AKD - into the suction connection of the pump POMix. The injection rate for conventional chemical feed did not exceed 2-3 m/s.

When upgrading the chemical feed system by installing the TrumpJet system, all of the above chemicals are fed to the manifold after the pressure screen, but separated into 2 mixers: cationic products (AKD, starch, PAA) through a Chord mixer, an anionic micro-polymer through a Forte mixer. Picture 2 shows the chemical feed system through the TrumpJet Forte/Chord mixer. Picture 3 shows the general view of the TrumpJet mixer in a section.



Picture 2 – TrumpJet chemical feed system Forte/Chord



Picture 3 – General view of the TrumpJet mixer in a section

The principle TrumpJet is based on the flow of liquids in three coaxial cylinders: a – mixing stock flow, b – chemical flow, c – injection flow. Due to this flow, the injection rate is of the order of 25-30 m/s, which is 10 times higher, in comparison with the conventional mixing system. To achieve such a powerful injection allows booster pump. The suction pipe of the booster pump is connected to the collector after screen. The booster pump takes a part of the stock with a concentration of 0,8-1,2% and returns it to the Forte/Chord mixers as the mixing and injection flow (Picture 3). Thus creates a powerful pressure, promoting the uniform and flash distribution chemicals in the stock flow.

Chemical feed system modernization results.

To assess the modernization results, warranty tests on PM 7 were carried out between December 19 and 21, 2017, when offset paper 55 g/m^2 was produced. The target chemicals dosages are presented in Table 1. The final targets product quality are presented in Table 2.

Table 1- Target and actual chemicals dosage

Chemical	Initial dosage, kg/t	Reduction target, %	Target dosage, kg/t	Actual reduction, %	Actual average dosage, kg/t
PAA	0,2	25	0,15	25	0,15
Micro-polymer	0,31	10	0,28	10	0,28
Cat. starch	7,0	15	6,0	12,9	6,1
AKD	8,0	10	7,2	6,3	7,5

Table 2 – Target and actual paper parameters

Paper parameters	Before TrumpJet	After TrumpJet	Absolute ratio	Percentage ratio, %
Breaking length, m	5910	5861	- 49	-1 *
Absorbance (Кобб$_{30}$), g/m^2	24,0	25	1	- 4 *
Fiber retention, %	69,8	72	2,1	+3 *
Filler retention, %	38,0	39,9	1,9	+5 *

* «-» deterioration, «+» improvement.

As can be seen from the tables, it was possible to achieve the target (reduced) dosages on the retention chemicals (PAA and micro-polymer), while the retention was improved: by 3% fiber and by 5% filler. According to AKD and cationic starch, it was not possible to reach the target dosages, because when the dosages were lowered relative to the initial ones, the paper quality deteriorated by absorbency (-4%) and discontinuous length (-1%), but a reduction in the AKD by 6,3% and starch 12,9%.

Table 3 shows the calculation economic efficiency.

Table 3 – Calculation economic efficiency of the project.

Expense	**Consumption without TrumpJet, rub/t**	**Consumption with TrumpJet, rub/t**	**Saving rub/t**
PAA	50,4	40,0	- 10,4
Micro-polymer	80,0	72,3	- 7,7
Cat. starch	384,8	335,2	- 49,6
AKD	378,0	354,2	- 23,8
Filler	957,6	818,8	- 138,8
Fresh water	9,3	0,00	- 9,3
Total:			**- 239,6**

Based:

1. Savings of the chemicals obtained at reduced consumption.
2. Better filler retention.
3. Switch off fresh water for injection.

the reduction in the production cost is 239,6 rub/t. However, the payback period of the project on the modernization chemical feed systems for PM7 will be less than 1 year.

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