

# New Yarn Technology (E-Line) - Breakthrough in Forming Fabrics

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## ABSTRACT

Over the past decade, reduction of energy consumption has become one of the most important aspects of sustainable development for paper makers. Influencing the increasing power demand has not only been an environmental concern, but has also developed in to a recognizable part of today's paper production cost. This has been calling for improvement of efficiency achieved by new generations of material and design. The main drive in reduction of power consumption is non availability & cost savings. Fabric suppliers decided to find a material that could run a long time and that would be dimensionally stable – Yet had a low coefficient of friction to consume less energy on the machine and could work in all modern machine designs. The paper deals with E-line fabric technology used by ANDRITZ Kufferath which meets all these expectations in many successful case studies. Saving up to 30% energy consumption compared to conventional forming fabrics means a lot to paper maker.

## Introduction

Now a days, Indian Paper Maker is thinking more about energy than paper itself. When the machine is idle only for Power (Energy), in spite of every other in-puts are in place, the focus must be on energy. Energy costs have increased consistently over the past few years and show no sign of settling in the near future. Paper producers are constantly looking at ways to improve quality while reducing power consumption of their production lines. With acute scarcity of power in all parts of India and with rising energy costs, this has become a critical pursuit. This also led to the mills looking towards suppliers and work continuously upgrading their manufacturing process to achieve quality, productivity and most of all optimization of energy consumption. The role of suppliers changed in many ways and they are expected to participate as business-Partners. Paper Machine clothing including Forming fabrics suppliers have increasingly focused their development efforts in the past few years, changing from a mode where ever more complex structures were introduced to an approach which looks at solving a key paper making parameter through product characteristics. The very material being used to make forming fabric has also been developed to achieve the better durability, compact sheet formation, better retention, easy sheet release, MD/CD stability, no marking, easy operation, improved run ability and all these with reduced energy! The approach has provided several breakthroughs in Forming fabric technology.

## The response from forming fabric suppliers

Many mills are pushing their existing machines to their limits in order to maximize production and increase efficiencies. In some cases, older machines are running at speeds far in excess of the original design points and are stretching the electrical drive systems to the maximum. This makes the machines extremely sensitive to

power consumption peaks and they run the risk of tripping out because of too high a load.

The first response from forming fabric suppliers to resolve the problems associated with energy consumption was to change the designs of their fabrics to influence dewatering characteristics. These designs were intended to reduce vacuum levels, which would decrease the friction between fabric and flat box tops to lower the drag load. Another idea was to use fabrics that would drain more. The sheet would reach the press section with higher consistencies so that steam consumption in the dryer section could be reduced. Although these design improvements achieved quite a lot, they were not completely satisfying.

Another approach was to modify the materials of construction for the forming fabrics themselves. There is a very definite influence on fabric life and power consumption by changing from 100 % PET (Polyester) to a combination of PET and PA (Polyamide) yarns. The 100 % PET fabrics demonstrate comparably low drag loads, but have less wear resistance. Combination PET/PA fabrics run considerably longer, but require increased energy input. Increased use of abrasive calcium carbonate in alkaline sizing will continue to demand excellent life potential and retention. The "right" material compound was still missing.

## The missing link: long life + low friction

The task became to find a fabric material that could run a long time and that would be dimensionally stable yet had a low friction coefficient to consume less energy on the machine. Also, the material had to be resistant to all common chemical cleansing agents and to the needle jets of high pressure showers.

Just to add to the challenge, Andritz Kufferath decided to find a material that could work in all modern machine designs, with no limits from a weaving or application point of view.

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The E-Line series of fabrics is made from a material that meets all these expectations.

The forming section of a paper machine uses roughly 15 % of the machine's total energy consumption. Drive loads and vacuum systems account for some 80 % of the forming sections energy consumption . Balance 20% energy distribution is in accordance with hydraulic 1%, Pressurized air 1%, broke collection 6%, Shower water 9%, Ventilation 3%.(Fig. 1).

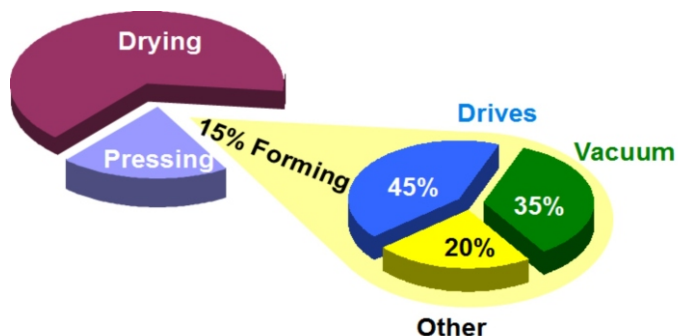


Fig. 1: Share of energy consumption in forming section of a paper

## E-Line Forming Fabrics

Forming fabric design is a compromise between fine and no marking ,low caliper mesh with desired forming surface and fiber support characteristics and also imparts long life and stability. The evolution of forming fabric design from Single layer to Multi layer leading to latest offering of SSB (Shute Support Binder) fabrics. This is a multi layer forming fabric in which binding yarns become a part of the fabric structure linking the top side and bottom side to provide superior sheet support, easy gentle drain ability, and high abrasion area.

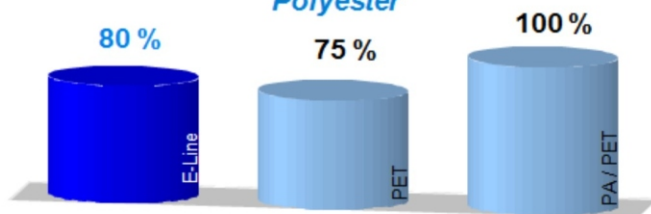
E-Line is a yarn technology used across all fine and publication grades, and has successfully entered the packaging grade sector. It can be used in all fabric design! The objective of E-Line technology is to develop a forming fabric for today's generation of paper machines that would significantly contribute to COST SAVINGS without sacrificing properties that have successfully been achieved by existing fabric versions already.

The development goal with E-line is to create a fabric with lifetime that meets mill expectations, is dimensionally stable, and has a low friction coefficient on the bottom side. The drag forces created between vacuum aided dewatering elements and the forming fabric passing over them are reduced. Reduced friction translates directly to reduced energy consumption. E-line fabrics have similar energy profile to 100% PET, but the life is better than of a fabric made from PA/PET combination. The material compound and fabric design both attributes for these positive results. The advantage for a paper maker is not only energy savings, but also that no adjustments are required on the machine itself when changing from a conventional fabric to E-Line technology.

## Application of E-Line

E-Line technology fabrics can be used in all machine positions where there is a need to reduce power consumption either due to a high but needed vacuum level, loads caused by a high number of vacuum- aided dewatering elements or drives that have reached their limits. Compared to a fabric that consists of PET yarns in the MD and alternating PET/PA yarns on the bottom side, E-Line fabrics show about the same energy saving (20 %) as the 100 % PET but have twice the life expectancy (Fig. 2,3).

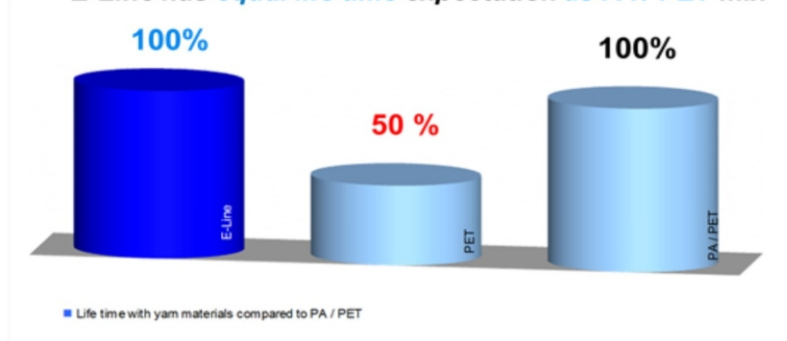
**E-Line provides comparable energy savings like Polyester**



■ Drive load with different yarn materials vs. PA / PET

PET Polyester  
PA Polyamide

**E-Line has equal life time expectation as PA / PET mix**



■ Life time with yarn materials compared to PA / PET

## On Machine Experience

E-Line forming fabrics have been used in all types of machines with encouraging results. One of the references given is at Smurfit Kappa's Redmond mill in Netherlands. Both machines of this mill have been methodically tweaked to speeds well above their original designs. As a consequence, their drives are running close to their limits and have become sensitive to maximum load.

On PM#1 they were using ANDRITZ Kufferath Microflex fabric (2.5 layer) for many years; then switched over to standard SSB ANDRITZ Kufferath Hegoflex fabric. Now during trials of Hegoflex E-Line yarn fabric, they observed lower power consumption and hence giving more flexibility in operating the machines. Formation, runnability, life also found improved as E-Line fabrics helps designer to go for thinner and finer configuration in weft tied or warp integrated SSB fabrics. Similar results are found repeated in other machine using double layer or 2.5 layer.

**PM Type:** Hybridformer: BelBond + 2nd Headbox  
**Width:** 5.48m  
**Speed:** 750 m/min  
**Grades:** Corrugated Medium, Liner, White Top Liner  
**Grammage:** 125-240 gr/sqm  
**Position:** Bottom fabric  
**Fabric:** Standard SSB  
**Furnish:** 100% Waste

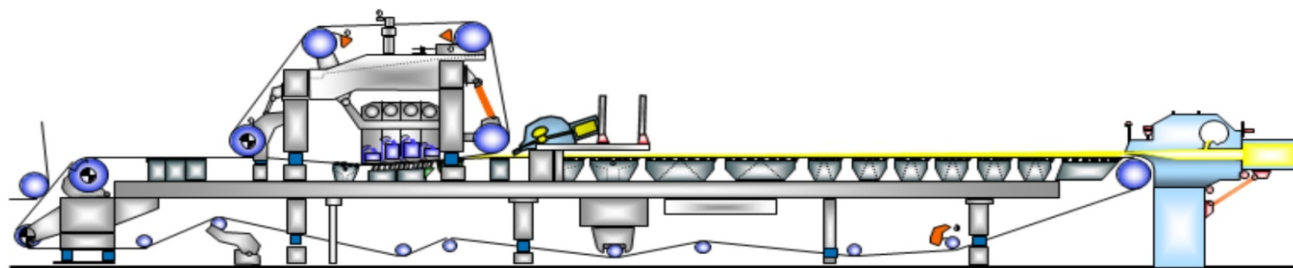
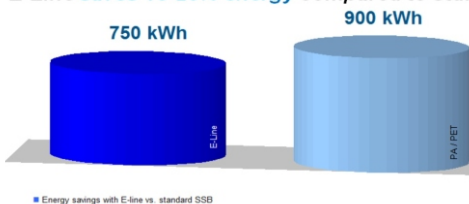


Fig. 4: Case study PM1 - Application.

**E-Line saves 15-20% energy compared to std. SSB**



**E-Line = 6.9 million INR annual savings**

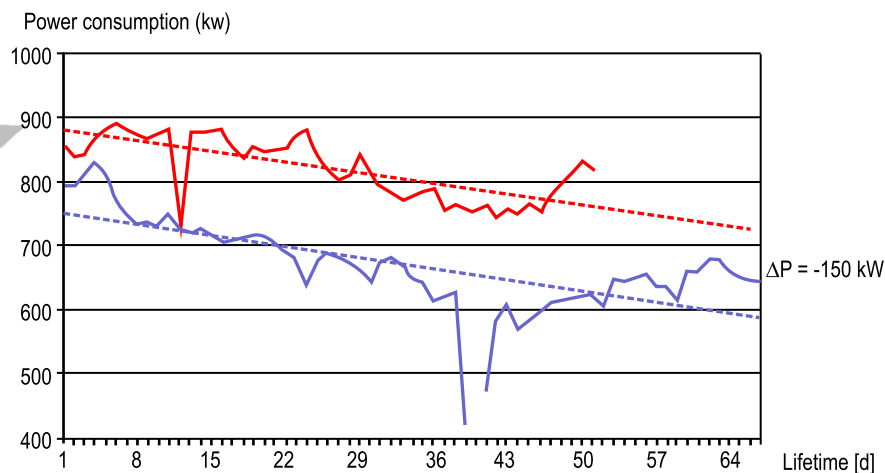


Fig. 6: Case study PM1 Drive load with E-Line

## ENERGY SAVING ON PM#1

Power consumption during running of Hegoflex L328-4 49/32 (std.SSB) : 900 kWh, Life 50 days

Power Consumption after usage of Hegoflex-E L 328-4 49/32 (E-lineSSB) : 750 kWh, Life 68 days

### Annualized average power savings E-line SSB vs Std.SSB

$$(900-750)=150 \text{ kwh} \times 24\text{h/d} \times 350\text{d/a} \times 5.50 \text{ INR/kWh} = \text{Rs.6,930,000}$$

Similar results have been observed in other machine too.  
 The results have been shown in figures given below.

**PM Type :** 2 ply Foundrier  
**Width:** 4.45 m  
**Speed:** 700 minim  
**Grades:** Cardboard, Testiner  
**Grammage:** 120-210 g/m<sup>2</sup>  
**Position:** Bottom fabric  
**Fabric:** Standard DL

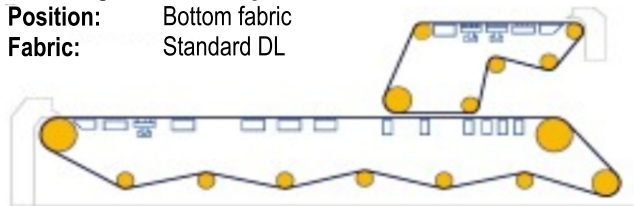


Fig. 7: Case study PM2 Application

**E-Line saves 15% energy compared to std. double layers**

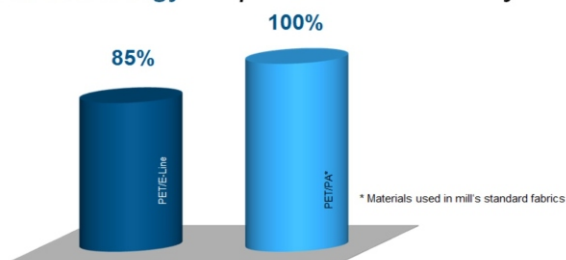


Fig. 8: Case study PM2 Energy savings

## Results

Early trials showed that important advantages of PET and PA could be combined in one material. In actual mill case studies it was discovered that energy savings could be even higher than predicted (fig.4-8). It ranges from min. 15 to 36%.

Fig.6 shows the quantitative development of two fabrics compared over two month period. The standard fabric (red line) and the E-Line fabric (blue line) have similar characteristics: The consumption of power decreases during fabric run. However, a constant differential of 150 kW was found. Life of the fabrics is found increased approx. 35%, but off couch dryness remain unchanged.

Similar results are found E-line and std double layer fabric comparison on PM#2.

## Conclusion

Following years of Research, Development and Mill trials, there is now forming fabric that contributes to significant energy savings while also delivering durable performance over a long life. The Fabric E-Line, is suitable for all grades of paper and all type of paper machines with any speed and configuration. No Changes are required to the machine when switching from a standard fabric to E-Line. It can be operated in the same way as the standard fabric versions.

E-Line fabrics being Special Yarn technology, designer can go for lower caliper for aided advantages. The compact sheet formation due to higher Fiber support Index may be the reason for even saving in starch and other wet end additives, a notable observation.

Thinner and finer configuration further confirms no sheet marking and better sheet release properties of sheet.

### For Paper Maker's delight, E-line products offer

- Reduction in energy cost
- Increase of total paper production
- Option to stay with standard designs
- No readjustment of paper machine operation
- Unchanged easy handling of fabric

Since the first trials, there are now more than 130 applications on graphic and Packaging paper machines. ANDRITZ Kufferath E-Line technology is developing as an important contributor to higher paper machine efficiencies with motivating cost economics.

## References

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