



PELTEC® X-ZYME

# Reducing waste water pollution while achieving higher leather quality

» Green enzymatic  
beamhouse technology



TFL – Great chemicals. Excellent advice.



# X-ZYME® – the future of beamhouse

The beamhouse process offers a great deal of innovation. The potential of the beamhouse process is to produce enzymes, with their specific catalytic properties, that make the process more efficient. In partnership with Novozymes, we have developed the X-ZYME process technology, a completely new, enzyme-based soaking and unhairing solution. Just by applying this innovative, functionalized biobeamhouse process more efficiently, reduce the amount of water, chemicals used and produce higher-quality leather. That is why the future of beamhouse generally applied in combination with

LEVOTAN® WRP, a high-performance synthetic waterproofing polymer. These form LANXESS's synergistic waterproofing system that eliminates the need for costly additional auxiliaries. LANXESS Leather delivers not only PFC- and BTX-Performance but goes far beyond and offers full MRSL compliance capabilities, critical substances for shoe production removal.

- Reduced risk of neck wrinkles and belly draw
- Potential area yield gain

## X-ZYME® – How you benefit

### Process

- Robust, controllable and stable process
- Proven reproducibility
- Consistent pelt quality
- Suitable for a wide variety of production conditions, raw hides and leather articles
- Fast fiber rehydration within 4-6 hours permits a high-quality, 24-hour beamhouse process
- 24-hour soaking process possible without collagen being damaged

### Sustainability

- Significant reduction of COD in effluent load
- Measurable lowering of sludge amount
- Considerable decrease in sulfur content in liming float
- Reduced use of chemicals



More efficiently – the X-ZYME® process technology, a completely new, enzyme-based soaking and unhairing solution



## Overcoming beamhouse challenges

This groundbreaking X-ZYME® technology has significant advantages over the conventional soaking and liming processes. In a traditional main soak, a considerable amount of time is normally required to achieve complete rehydration of the fibers. In view of the tight production schedules in a 24-hour beamhouse process, there is an increased risk of insufficient rehydration. Moreover, inadequate rehydration leads to an irregular opening up of the skin and causes wrinkles, draw and uneven softness.

Conventional unhairing processes also have their intrinsic characteristics. Even though hair burning results in fairly complete hair removal, the downside is a high effluent load caused by complete liquefying of the hair and the high amounts of chemicals used to achieve that goal. Hair saving produces a lower effluent load but does not ensure complete removal of fine hair, broken hair shafts or hair roots, which has a negative impact on the final leather quality. Furthermore, in both conventional processes additional auxiliaries are needed for satisfactory process control, which means both higher costs and heavier chemical pollution of the wastewater.

The new X-ZYME® technology overcomes these problems and offers a best-of-both-worlds solution for the unhairing process. Just with two industrially produced enzymes it covers the entire soaking and unhairing process. The result is a fast and robust process allowing 24-hour production and generating clean and high quality pelts whilst significantly reducing the beamhouse effluent load.

## Exclusive partnership

X-ZYME® is the outcome of our exclusive partnership with Novozymes. Novozymes' leading-edge know-how in enzyme technology research is ideally matched by TFL's long-term global expertise in the development of leather-making processes.

The enzymes involved were meticulously selected and developed by using protein engineering and advanced robotic, high-throughput screening to obtain the desired characteristics. Since they are produced by microbial fermentation, the highest levels of purity, quality, consistency, and specificity in use are ensured. In addition, We have deployed its process know-how to ensure that the enzymes can be successfully employed under real-life beamhouse production conditions. This excellent combination of enzyme development expertise and beamhouse process know-how guarantees a high degree of process stability.

PELTEC® X-ZYME



# Unique 2-step process technology

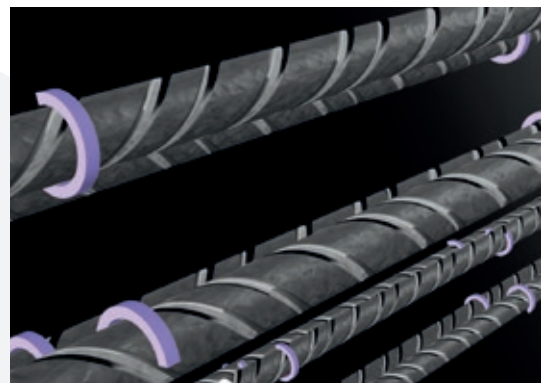
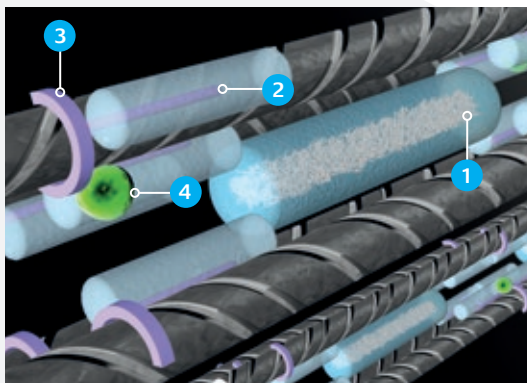
## PELTEC® X-ZYME SN for efficient soaking

The first enzyme, PELTEC® X-ZYME SN, is applied in the main soak. The main aim of this step is to achieve good fiber rehydration. This requires thorough removal of hyaluronic acid (HA), which is located between the collagen fibrils. HA fills the interfibrillary space and prevents the penetration of water and subsequent process chemicals.

Contrary to conventional soaking methods, PELTEC® X-ZYME SN speeds up the soaking process by degrading dermatan sulfate proteoglycan, which keeps HA locked in the interfibrillary spaces. Here it cleaves off the glycosaminoglycans (GAGs) from the protein backbone of dermatan sulfate.

Thus, HA can be more easily washed out and complete rehydration of the fibers is achieved. Unlike conventional proteolytic soaking enzymes, PELTEC® X-ZYME SN does not degrade the protein backbone. The collagen remains intact even in case of accidental overdosing. A further advantage is that the fiber structure is already opened up during soaking, which results in reduced lime input during the subsequent liming process.

### Schematic view of PELTEC® X-ZYME SN cleaving off GAGs from protein backbone



- 1. Hyaluronic acid    2. GAG
- 3. Protein backbone    4. Peltec® X-Zyme SN

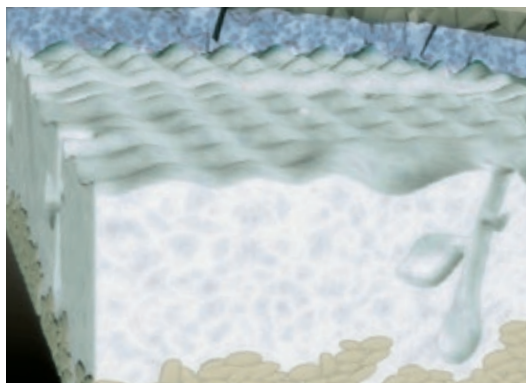
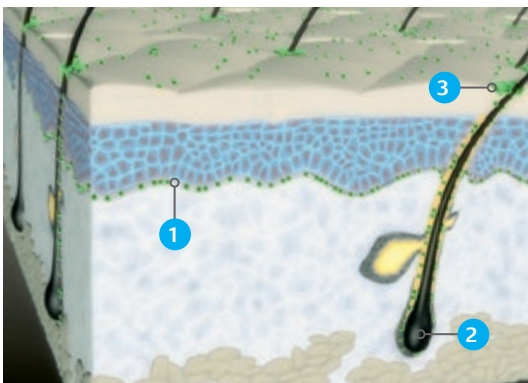
## PELTEC® X-ZYME UP for excellent unhairing

The second enzyme, PELTEC® X-ZYME UP, has been developed for use in hair-saving or semi-hair-saving processes. Added to the float, it degrades the pre-keratin of the basal membrane of the epidermis, which loosens the hair roots and also prepares for epidermis removal. This eliminates the use of organic sulfur products normally required in the pretreatment of the hair-saving process.

As a result, there is no chemical degradation of the hair. The hair remains more flexible and becomes less brittle. At the same time, excessive swelling of the pelts is avoided since less lime and sulfide are used. The combination of both these factors prevents broken hair shafts and hair roots remaining in the pelt.

The unhairing enzyme, PELTEC® X-ZYME UP, can exactly be controlled. After sufficient loosening of the hair, lime is added and the pH raised above 10.5. This completely stops the enzyme activity and at the same time immunizes the hair. In a following conventional hair-saving or semi-hair-saving process final removal of hair and epidermis is achieved with a lower input of chemicals.

### Schematic view of PELTEC® X-ZYME UP degrading basal membrane of the epidermis



- 1. Epidermis basal membrane
- 2. Hair root
- 3. PELTEC® X-ZYME UP





# All-round advantages technology

## X-ZYME® technology brings big beamhouse benefits to the tanner

### → High pelt quality:

The X-ZYME® process ensures relaxed, well let-out pelts with only moderate swelling. This basically has two main advantages. First, uniform opening up of the fibers without the negative effects of grain swelling of the pores, which prevents hair, hair roots and scud becoming trapped in the follicles. This, combined with very good hair loosening, delivers an extremely clean pelt. Second, the risk of belly draw and neck wrinkles is significantly lower. Both factors produce high-quality leather with good dyeing properties.

### → Proven process stability:

The X-ZYME® technology has proven to be a safe and robust process with good reproducibility results. Moreover, it is suitable for a wide variety of production conditions, raw hides and leather articles. This is particularly important for the soaking process since PELTEC® X-ZYME SN allows an easy adaption of the process time to the demands of the raw hides without risking insufficient rehydration or damage to the collagen. This means that the soaking process is entirely feasible within five hours, leading to a highly efficient and complete 24-hour beamhouse process. Moreover, a 24-hour soaking process is attainable without damaging the collagen. Last but not least, the unhairing activity of PELTEC® X-ZYME UP can be easily controlled by adjustment of the pH value.

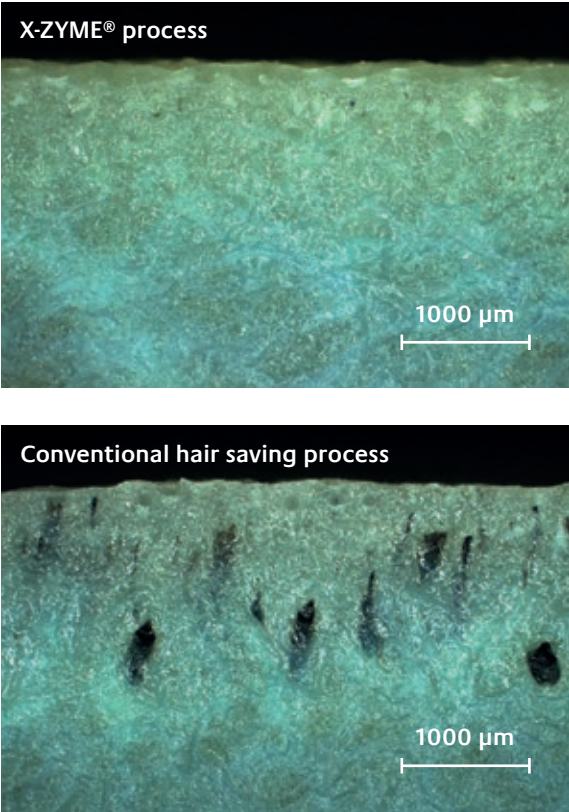
### → Reduced effluent load:

The X-ZYME® process requires significantly fewer chemicals, such as surfactants, organic sulfur compounds, amines, etc. Since all these chemicals increase the waste load of the effluent, the X-ZYME® process measurably improves the COD value and minimizes the sulfide content. In the hair-saving process, where the hair is removed by filtering and less lime is required, the amount of sludge and the level of nitrogen pollution in the wastewater are also considerably reduced.

### → Potential area yield gain:

Thanks to the reduced alkalinity in the liming process X-ZYME® pelts are more relaxed and better let out than conventionally manufactured ones. This improves the potential area yield gain in the crust and ensures a high cutting yield thanks to a larger and cleaner cutting area.

Excellent hair removal



Improved waste water values

	Sludge		Sulfide		COD	
100	100 %		100 %		100 %	
80						
60						
40		~ 55 %		~ 62 %		
20		~ 32 %		~ 45 %		
0	Hair burning	Hair saving	X-ZYME®	Hair burning	Hair saving	X-ZYME®

All percentages are average values referring to a standard hair burning process and based on internal measurements.



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