

SUSTAINABILITY: CO2NEXUS & PATAGONIA

A Denver-based textile technology company has received a big boost to its idea of using liquid carbon dioxide as a solvent for cleaning, disinfecting and coating fabrics and textiles by signing up Patagonia as a supporter and as a user.

When the water runs out

CO2Nexus has developed a system for industry-wide waterless textile processing. Yes, waterless. From the manufacturing stage to the laundering and maintenance of technical textiles, the Denver-based company's Tersus Solutions platform is designed to clean, disinfect, decontaminate, finish and coat – all by using liquid carbon dioxide (CO₂) instead of water.

Having shipped its first commercial Tersus machine to a Patagonia facility in March this year, and with water crises seemingly erupting around the globe, CO2Nexus is positioning itself to redefine how the industry processes textiles.

Why not water?

Today, making one cotton T-shirt can require the use and recycling of around 2,700 litres of water, the same amount of water the average person drinks in three years. Granted, cotton is

a particularly thirsty crop, but all textiles require water at nearly every stage of development. Water is a natural capital that's always been cheap and abundant, so the textile industry has evolved around machinery, processes, protocols, chemicals and care methods that assume its endless availability.

But water is not always endlessly available, and in many places is no longer cheap. Drought is affecting not only desert-locked developing countries; it's also having withering effects on sophisticated, well developed economies. São Paulo, Brazil's largest, wealthiest city, is experiencing its worst drought in decades. Dengue fever has broken out there and sanitation is becoming unreliable. Businesses are, unsurprisingly, suffering.

In California, the world's eighth largest economy, Governor Jerry Brown recently stood in a field of dry grass to announce an executive order to reduce the state's water consumption

With Patagonia's home state of California facing one of the most severe droughts on record, Governor Jerry Brown declared a State of Emergency in January 2014.

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by 25%. The location of his press conference was sobering: it was March and this area of the Sierra Nevada mountain range should have been covered in white snowpack; instead it was brown and dry. “We’re in an historic drought and that demands unprecedented action,” he told those in attendance. Every person and business in California stands to be affected by the imminent restrictions. California is Patagonia’s home state.

The launch of Tersus comes not a season too soon. But despite despairing headlines, CO2Nexus is quick to acknowledge that industry-wide adaptation and adoption of waterless textile processing will only happen when this new method is judged to be better than the old.

Why carbon dioxide?

Using carbon dioxide to launder individual garments is not a new idea – dry cleaners have been using it for years – but the CO2Nexus technology brings this method to an exponentially larger scale and more complex purposes. Tersus, according to the company, improves performance and processing times, requires less space and natural resources, and is gentler on garments than traditional methods. Garment performance alone is reason enough to switch from water to carbon dioxide, according to Brit Gibson, market manager for Tersus. She says: “Carbon dioxide outperforms water because of its natural properties. CO₂ easily permeates small pores in fabrics, unlike water, which is a harsh solvent to fabrics. CO₂ also requires less surfactant than water to remove dirt, oils and contaminants.” By being exposed to fewer chemicals, the fibre quality and technical coatings (such as DWR or flame resistance finishes) undergo less degradation. Waterless processing, perhaps unsurprisingly, also does not require dryers. Think about the lint and pilling that accumulates from every session in a laundry dryer; this is degradation, and it occurs in every instance of drying. Ms Gibson says this can be avoided, CO₂ processing leaves garments dry and cool. “The same is true for any type of technical coating on the garment,” she says. “[Drying can] degrade any waterproofing, antimicrobial coating, or other technical finish a garment might possess.”

Other benefits include relatively low laundering and processing times, which can translate into increased productivity and decreased energy costs. According to Ms Gibson, an entire batch can be processed in just 30 minutes, depending on the state of the garments. “We anticipate that all wet textile processes will see similar time gains,” she adds, “because CO₂ is more efficient at coating garments, and we eliminate drying and heat



The Tersus machine Touchscreen allows users to choose settings based on the specific qualities of the textiles being processed.

Asleigh Miller Photography

setting steps.” The footprint of a textile factory can be reduced, as a single machine is used to clean, disinfect, coat and dry. Further, as a waterless platform, Tersus doesn’t require water heaters, pipes, or other wastewater facilities.

Thus far, CO2Nexus has recorded energy savings of up to 60% and a (not yet quantified) reduction of greenhouse gas emissions. With closed loop processing, all contaminants or residue is captured within the machinery. “No waste streams or wastewater is dumped into municipal water systems,” according to Ms Gibson. And, of course, there’s that 100% reduction in water usage.

Going waterless

Last year, the California Energy Commission (CEC) concluded an 18-month study that involved, among other tests, the use of Tersus in the laundry of Aramark (a Fortune 500 food, facility, and uniform services company). In an overview of the final report, the CEC said: “Results at the Aramark laundry, where the carbon dioxide process was used for clean-room garments, found the process is gentler on fabric than a traditional wash-dry cycle, extending the life of clothing and resulting in less shrinkage and wear.” The report estimated annual water usage savings of 60 million gallons, equal to the amount of water 850 homes would use in a year.

Nonetheless, moving away from water-reliant methods requires a certain change in mindset.



Richard Kinsman, CEO of CO2Nexus, speaks at the official unveiling of the commercial Tersus machine. "This is not just a washing machine... It's a system that's capable of cleaning, capable of sterilising, capable of coating, capable of finishing, and we very well expect we will be capable of dyeing fabrics in this machine as well."

Ashleigh Miller Photography

"One of [our] most important initiatives is reframing business operations to value natural capital," says Ms Gibson. "Currently, the private sector does not value these aspects of the natural world, despite dependence on them. Companies risk undermining their own growth by not owning their dependency on, and impact upon, natural capital."

She points out that this natural capital is broadly undervalued. "Right now our greatest obstacle to growth is the lack of awareness of water issues and the low, inaccurate prices currently levied for water," she says. "The current prices for this precious resource do not provide the right market signals to the private sector."

In some countries, water maybe considered cheap, so businesses are not motivated to limit usage. "Most communities and companies take water for granted," she says. "If we consider the intrinsic and appropriate monetary value of natural capital, what new innovations can we uncover? This is how the Tersus platform was born – by asking 'why do we have to use water for all this?' No one is asking that question."

Patagonia brings Tersus to the retail sector

Actually, some people are asking that question. In April 2014, outdoor brand Patagonia, which consistently wins recognition as a leader in forward-thinking eco-friendly business practices, announced a strategic investment in CO2Nexus. The money went through Patagonia's \$20 Million & Change initiative, a fund aimed at helping "innovative, like-minded start-up companies bring about solutions to the environmental crisis through business".

Patagonia was attracted to CO2Nexus because of the start-up's potential to help consumers use fewer natural resources. Waterless textile processing enables Patagonia to further two

environmental goals of minimising waste: using less water and extending the life of a garment through proper care. "Tersus water-free textile cleaning enables consumers to reduce the impact seen in cleaning their garments," says Matt Dwyer, director of materials innovation and development at Patagonia. "Laundering of a garment – including water, energy, and detergent usage – is one of the largest environmental impacts over the life of the garment."

This March, just under a year after the announcement of Patagonia's investment, the first commercially shipped Tersus machine was delivered to a Patagonia facility in Reno, Nevada, to be used as part of Patagonia's gear service programme. "This was a huge milestone for us," says Ms Gibson. "It is a nice validation to partner with an industry leader like Patagonia."

A specific use for the machine will be servicing Patagonia's Encapsil Belay Parka, which provides an excellent example of waterless laundering's value. Launched in a limited run of 1000, the \$700 parka is entirely independently baffled (to maintain uniform insulation), differentially cut, and insulated by Patagonia's proprietary plasma-treated, water-repellent Encapsil down. Details of the parka's intricacies and benefits can fill about a page, but so can its care instructions – and wet laundering is not an option.

With Encapsil down a defining characteristic of the parka, even dry cleaning at a local shop is not adequate. "The solvents and chemistries used in traditional dry cleaning may damage the chemistry and functionality [of the parka]," says Mr Dwyer, "so Patagonia recommends that owners use the included CO2 cleaning service."

The 'included CO2 service' is Tersus. When owners feel their Encapsil parkas need cleaning or repair, they can print a mailing label and send the parka to Patagonia who will provide the

relevant service and return the parka to the customer, all included in the initial \$700 price. Until recently, this meant forwarding the parkas on to CO2Nexus' Denver facility; now, Patagonia will do the work in-house with its own machine.

Offering this for free was essential, according to Mr Dwyer. "The Encapsil Down Belay Parka is a pinnacle product with the highest performance," he says. "As such, it needs to be cared for in a way that preserves this high performance, and offering the service as part of the package ensures that the garment's performance will be long lasting."

Patagonia has formed entire movements within the company around the concept of extending garment life. Worn Wear is a Patagonia initiative that, according to Adam Fetcher, Patagonia's director of global public relations and communications, "[drives] the conversations we have with customers about the enormous environmental impacts they can achieve if they keep their clothes in use longer."

Ms Gibson calls the concepts of garment life "one of the most prominent narratives in branded apparel right now. It's the antithesis of 'fast fashion'," she says. "[We're asking] 'How do we decrease garment waste?'" For CO2Nexus, this means continuing to develop ideas for the care and service of garments that will extend their lifespan, maintain and restore their technical functions, and reduce the resources necessary to do so. "For brands," says Ms Gibson, "this can mean greater customer satisfaction, brand loyalty, and the potential for new revenue streams."

Tapping the potential

Ms Gibson hopes that other companies will begin to emulate Patagonia's move towards using Tersus to preserve the quality and lifespan of garments. "[The] real value is in providing a better and enhanced product – and a better product experience to customers," she says. "Not all companies will be drawn to the sustainability component but we believe our strategic partners are all interested in providing a better product."

For the manufacturing sector, she recognises going waterless won't be without some fairly significant shifts – largely because water is so deeply ingrained in the existing infrastructure of textile processing. "All the chemicals and solutions used in technical apparel and gear are optimised for water-based processing," says Ms Gibson. "We are just beginning to understand the full potential of waterless processing in the textile industry. We all know how water-intensive textiles and garments are, but designing appropriate technical solutions to solve those problems takes time."

Even Patagonia, a company that needs no



Included in the \$700 cost of Patagonia's Special Edition Encapsil Down Belay Parka is free servicing using the Tersus waterless platform.

 Patagonia

convincing to embrace waterless technologies, is still exploring how to more extensively utilise its new Tersus machine. "We are always interested in proliferating impact-reducing technologies," says Mr Dwyer. "We're working hard to expand the capability and its impact on our line."

This is still a new concept, and change does not always happen fast, but Ms Gibson is confident that shifts are already under way – beginning, perhaps, in drought-stricken California. "I think there will be industries and organisations that do change," she says. "There are a lot of thoughtful entrepreneurs, government officials, and individuals in California that will step up."

CO2Nexus also expects to expand its international presence this year. "Our plans include serving markets where water scarcity and water quality challenges are rising dramatically," says Ms Gibson. "This typically coincides with the geography of the textile supply chain." CO2Nexus and Israel-based Dingo Ltd Group signed a distribution agreement in February to bring Tersus to Egypt, Israel, Jordan and Turkey – countries considered to be water constrained. "Just as Patagonia is forward-thinking in pursuing sustainability in its supply chain, other organisations will begin to move into meaningful conservation and work with us to completely eliminate water," says Ms Gibson. "I think we will see some really interesting projects emerge in the next year." 