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Better Threads
Findings From the Business Roundtable
(Monday 26 September, 2016, Interface, Sydney)

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A project of the Centre for Sustainability Leadership



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Introduction

What is Better Threads?

Every year the Centre for Sustainability Leadership (CSL) runs a Fellowship program during which participants form groups in order to plan and action small-scale projects that aim to create positive change.

This year, a group of five participants from the Sydney CSL cohort coalesced around the idea of adopting Circular Economy (CE) principles and practices (see Appendix A) in the textile industry. Inspired by MUD Jeans, a company that has successfully established a CE business model in Europe, the project focused in on the denim industry in Australia.

Known as Better Threads, the project group convened a business roundtable that discussed the barriers and opportunities for adopting CE approaches in the life cycle of denim in Australia.

Held on 26 September 2016 at the showroom of Interface Australia in Sydney, ten invited individuals and organisations attended the business roundtable. Participants came from a range of sectors including charitable retailing, national logistics, denim manufacturing, waste/material recycling and consulting, academia, textile engineering, and sustainable supply chain management.

The business roundtable aimed to create a pre-competitive and collaborative environment that allowed open discussion and sharing of information across relevant industries. In addition, by bringing together parties that are integral to CE, the project team facilitated connections between individuals and organisations that could instigate projects and enable change.

Facilitator Tim O'Brien, the founder of Hatched an advisory firm for purposeful business, led the three-hour long discussion. Issues were explored by participants through a Panarchy model, a theory in complex systems and how they transform. This model helped to identify where the denim industry in Australia is currently situated, and the current barriers, opportunities and potential levers for change. In addition, a CE model was mapped in order to identify and understand what components of the system need to be established.

Bert van Son, CEO of MUD Jeans joined the business roundtable discussion, providing a short presentation about the company's business model (see Appendix B), sharing his experience of developing the enterprise and some of the challenges that may be faced by those wanting to develop a similar model in other regions.

Participants engaged openly in discussion, sharing valuable experience and information, and identifying areas where collaboration or future projects could occur. Mapping a CE model for the denim industry in Australia, the roundtable clearly identified:

- areas for further research and exploration;
- where CE principles/practices could be adopted;
- potential scenarios for accelerating change.

Building on the findings from the business roundtable, the Better Threads team will evolve in coming months and continue to work for the development of CE principles and practices in the textile industry in Australia. It welcomes approaches from any parties interested in working towards this aim, including individuals and organisations that believe they can make a contribution.

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Executive Summary

While we don't know exactly how many jeans are disposed of each year in Australia, from the tonnages received by charitable recyclers we know that it is significant in terms of valuable raw materials being removed from the productive economy.

According to the latest figures, up to 40% of the 300,000 tonnes in donations of clothing and household items to charitable recyclers annually ends up being deposited in landfill. One national charitable recycler reports that 75-80% of the jeans they receive are either sent to landfill or exported depending on the condition in which they arrive.

These figures do not include the clothing that Australian households are already disposing of directly to landfill through kerbside collections.

A global movement using the principles and practices of the Circular Economy (CE) is beginning to stimulate changes in consumer behaviour and reduce the environmental and social impacts of the denim industry globally.

The CE goes beyond recycling as it is based around a restorative industrial system geared towards designing out waste. The goal is not just to design for better end-of-life recovery but to also minimise energy use and environmental impacts.

A company that exemplifies this approach, MUD Jeans, offers an ethical consumption model for customers and realises the value for denim beyond the 'wear' phase. Established in Europe in 2012, this truly 'Circular Denim Brand' is currently leasing around 15,000 pairs of jeans across various markets, hoping to reach a target of 100,000.

With its customer-base primarily in Holland, MUD Jeans has demonstrated that with a population roughly comparable with Australia, in a market that sells around 20 million pairs of jeans overall each year, a circular business model can work effectively.

However, factors related to the market, policy settings and geography mean that CE approaches need to be designed specifically for the markets in which they operate. To discuss the barriers and opportunities for applying CE principles and practices to the denim industry in Australia, MUD Jeans lent its insight and expertise to the recent business roundtable in Sydney.

Held on 26 September 2016, the business roundtable covered the following areas of discussion and enquiry:

- How the denim industry currently operates in Australia and the problems/challenges that it faces;
- How successful CE approaches to denim operate and where they are working globally;
- How CE principles and practices might be applied to the denim industry in Australia - the barriers, the opportunities and the levers for change.

When considering the denim industry from a systems level, the roundtable participants identified that there were problems being faced by denim makers, retailers and consumers but they were largely 'hidden' by market dynamics, business resistance to change and policy silence in relation to textiles waste. These include growth in consumption outpacing end-of-life solutions for denim; problems associated with waste; volatility in markets for labour and resources including energy, water and raw materials; and stakeholder expectations towards more circular/sustainable practices.

However, businesses are beginning to see opportunities in developing more circular/sustainable practices when it comes to apparel. This is demonstrated by discussions taking place between industry, governments and the charitable sector; and was evidenced by a number of case studies from overseas where apparel and denim specifically have been subject to successful take-back/repurposing/recycling programs.

When it came to envisioning a CE approach to denim in Australia, it was clear that there are many different angles from which this can be approached, including:

- waste/material streams - the waste textile stream and end-of-pipe solutions ie. addressing the immediate need for solutions to waste accumulation of textiles;
- product design & stewardship - new products being created and/or entering the market - designing, making and retailing these products in consideration of their full life cycle;
- industry conditions - creating the right kind of market/policy environment for a successful circular textiles industry in Australia with recycling capability;
- business action - leadership within business to set their own benchmarks for performance, influence and change consumer behaviour and supplier practices;
- infrastructure investment - the kinds of infrastructure, skills and equipment required to make a circular denim model work and the economics around it;
- product development - developing markets for specific products that are made from recycled denim/textiles, whether re-manufactured in Australia or offshore;
- engagement - how communities and consumers can frame and influence the development of a circular textiles industry in Australia - for example, take-back schemes.

Discussion between participants revealed that many of the skills, the knowledge and experience to develop CE approaches already exists in Australia. But there was more work to be done in understanding the viability of establishing a textile recycling and manufacturing process here.

Through bringing MUD Jeans to Australia, to engage with key stakeholders interested in developing CE principles and practices in denim in Australia, the Better Threads project has contributed to critical thinking and development.

The roundtable discussion was an important first step in bringing together relevant parties, encouraging open discussion and sharing of information, and initiating connections that will continue to evolve.

1.0 Findings from the roundtable

1.0 The Invisible Crisis: The Real 'Costs' of Denim

"We're edging towards a tipping point where we're suffering from 'see no evil, hear no evil' phenomenon. We all know there's resource scarcity, we all know that there is labour volatility and we all know that there's waste accumulation. And you see this kind of tension building up. The reality is that denim companies big and small are exposed to these challenges but it hasn't really come to a situation where we see a disintegration of the system."

- National logistics provider

The Panarchy model was chosen as a means to explore how to transition to CE approaches in the denim industry in Australia.

From an economic and business perspective, the stages identified in the Panarchy model can be described broadly as follows:

- Growth - Rapid growth, competition for resources, new players coming into the market, dynamism;
- Conservation - Few players (more powerful players), holding onto resources, resistance to change;
- Release - Levers force change and accelerate growth, systems collapse, chaos, energy released (e.g the Global Financial Crisis); and
- Reorganisation - Application of learning and reorganisation.

The Panarchy model is a useful way to elevate thinking, share perspectives and visualise how a system might change. In particular, it can enable identification of levers and barriers that exist between the 'Conservation' and 'Release' phases.

The response of participants to the Panarchy model showed that the majority felt the denim industry in Australia was currently situated in or around the 'conservation' stage. They also identified existing or looming challenges to current business models, of which industry is either unaware or not fully addressing. These include growth in consumption outpacing end-of-life solutions for denim; problems associated with waste; volatility in markets for labour and resources including energy, water and raw materials; and stakeholder expectations towards more circular/sustainable practices.

Although there are government-funded programs for accelerating CE in various Australian jurisdictions, there have been no major efforts at a national policy level to better manage textile waste, although business and consumers are beginning to identify the benefits. In November (2016), Sydney-based consultancy Edge Environment, convened an event Circular Threads Workshop: Establishing a textile recovery industry in Australia, with the support of the NSW Government's Waste Less, Recycle More program. The purpose of this event was to "stimulate an industry in Australia to re-purpose, recycle and/or re-manufacture textile products".

Environmental consultant Mike Ritchie recently called for a Circular Economy Commission that would "untangle the thicket of obstacles that prevent the market from delivering on the benefits of a CE circular economy" and is a firm believer that the CE "won't happen by itself".

"Government often intervenes to shift market behaviour... It is neither unusual nor unreasonable to expect that Government should take a similar, policy-driven approach to removing the constraints that impede the circular economy. These might be constraints imposed by regulation (or a lack of regulation), incentive structures, public infrastructure or service provision."

- Mike Ritchie (<https://blog.mraconsulting.com.au/2016/10/06/why-bother-with-the-circular-economy/>)

One participant noted that Australian industry is currently operating at different ends of the spectrum of innovation - with a significant proportion of business operating from a conservative baseline as opposed to a smaller number of highly innovative enterprises such as ethical clothing brands. Does this highlight

an opportunity for industry and government to occupy the ‘middle ground’ by developing transitional technologies and systems to developing a CE for denim and textiles more broadly? This question will be explored further in section 3.0.

1.1 Consumption and ‘Waste’

There are no figures publicly available on the number of jeans sold in Australia each year. By comparison, in a country such as Holland with a population of around 17 million people, jeans sales are estimated at 20 million pairs. With most of its client base there, MUD Jeans, leases around 15,000 pairs of jeans in the Dutch market.

What we do know, is that Australians purchase 27 kilograms of new textiles each year on average, and also discard 23 kilograms with most destined for landfill (Textile World).

According to one roundtable participant, consumption has increased 400% over the past two decades. This is reflected in greater tonnages being received by charitable recyclers including illegally dumped material. In 2012, charitable recyclers received 300,000 tonnes of donated clothing and household goods, of which around 40% was disposed to landfill (National Association of Charitable Recycling Organisations).

A participant from the charitable sector, operating a national network of 350 retail outlets for recycled clothing and other household goods, said:

“The percentage of what we can actually use is mid to high 20%, the rest of it goes to landfill because of the condition it’s in by the time it gets to us.”

“For jeans, we would sell them anywhere from \$5 to \$50 depending on the brand. If they’re not sold in store then all our textiles are sold by the kilo [for export], which is about \$2.50 per kilo. But we have tonnes, you’re talking tonnes.”

Textile waste in landfill contributes to the formation of leachate as it decomposes, which has the potential to contaminate groundwater. Another product of decomposition in landfill is methane gas, which is a major cause of greenhouse gases, significantly contributing to global warming, although it can be utilised if collected. The decomposition of organic fibres and yarn such as wool produces large amounts of ammonia as well as methane. Ammonia is highly toxic in both terrestrial and aquatic environments, and can be toxic in gaseous form (Apical International Pty Ltd: 2009).

Aside from environmental impacts, disposal of textiles and natural fibres to landfill fails to realise the value of these materials in the productive economy. There are currently no facilities in Australia to commercially recycle cotton fibre, and the participants agreed that market barriers to establishing such capacity are complex.

One participant, the founder of several ethical clothing brands, noted:

“If we talk about recycling denim here in Australia... I see my profit margins going down. We use recycled polyester but we pay a premium for it... it’s not necessarily cost effective.”

1.2 Supply Chain Issues

A recent report into clothing supply chains, the Australian Fashion Report from Baptist World Aid found that 61% of companies didn’t know where their garments were made; 76% didn’t know where their fabric was woven, knitted or dyed; and 93% didn’t know the origins of the raw fibre.

While Australia produces only 3% of the world’s cotton, it the third largest exporter of cotton in the world, and produces a very high quality yarn. Over 99% of Australia’s cotton is sent overseas, with only a very small

spinning industry left in Australia (Cotton Australia). While Australia has a cotton industry, it does not produce cotton for the denim worn in Australia – 92% of the clothing we buy in Australia is made offshore (Council of Textiles and Fashion Industries of Australia).

Having just toured a facility in Sri Lanka, making clothing for retail chain GAP, one participant noted that the producers were unaware of post-consumer waste in Australia as their own textile waste is either recycled or used for energy recovery. She said:

“We’re probably still in a status quo situation where we may have reached a crisis but not all elements of the supply chain can actually see where we are”.

Other participants suggested that the full ‘costs’ of producing a pair of jeans from the environmental and social impacts - of raw material use, processing/manufacture, transport and end-of-life - are not accounted for by the companies that produce these products or the sale price paid by consumers.

Bert van Son of MUD Jeans said:

“The [recycled] denim we buy from Valencia is more expensive than virgin cotton, so there are economical problems. If you calculate the water and labour, [virgin] cotton should be much more expensive.”

2.0 Findings from the roundtable

2.0 Review of CE Approaches in Denim Globally

“What we’re doing [at this roundtable] is unique but there are parallel discussions in other places. We see a new considered approach to consumption even though it might not be the mainstream.”

- National logistics provider

The roundtable participants explored CE initiatives in apparel and denim from other parts of the world, including Circular Denim brand MUD Jeans.

Transforming the apparel sector to CE - where products, components, and materials are at their highest value at all times - involves three key elements, according to global non-profit Business for Social Responsibility (BSR):

- Eliminating waste along the value chain;
- Restoring resources that the sector relies on;
- Extending the life cycle of products.

This shift would lessen the environmental impact of the sector and even potentially restore resources, says BSR. While it covers all aspects of the business – from design, to sourcing materials and dyes, to retail and distribution – one of the keys to success is changing consumer behaviour. The “use” phase, when clothes are actually purchased, worn and discarded, is a particularly challenging aspect of the shift toward a circular model (see Appendix A).

2.1 Leasing Jeans

MUD Jeans is a sound case study for how the CE utilising a business model that provides greater control over raw materials and gives consumers a more ethical means of using and disposing of jeans. The company produces jeans from certified sustainable cotton and also recycles jeans at the end of their life. Customers can buy or lease a pair of jeans, and once they are finished with the product, return it to MUD Jeans to be either up-cycled as vintage items or shredded and blended with virgin cotton to create new denim yarn (see Appendix B). The leasing model is a way to extend the product life as well as give customers the freedom to participate in fashion trends.

2.2 Repairing Jeans

The ‘use’ stage of a garment’s life is critical, and an example of current initiatives to extend the life of denim comes from Levis. More than 80 Levi’s stores globally now have tailor shops that can repair, resize and restyle customers’ denim – to extend the life of their products and change consumer habits.

In Sydney, Swedish denim Nudie Jeans offers a repair service in its flagship store in Paddington.

2.3 Recycling Denim

Clothing giant H&M launched its garment collection initiative in 2013, which asked shoppers to donate unwanted clothing items in order for them to be recycled and used in future product ranges. Since the program began, more than 14,000 tons of clothing have been donated globally and used, beginning with a denim collection that launched in February 2014, to make clothing under the retailer’s “Close the Loop” label. Only 20% of the cotton used in the collection comes from the recycled clothes, but H&M says it’s working on fabric-salvaging technology that will help it increase that percentage.

Other initiatives around the world are working on similar technology, including Australia's own Deakin University. It is developing a commercial process to separate cotton fibre from other fibres in order to create the pure waste stream that's required for recycling. The CSIRO has a spinning machine for test batches of new cotton.

Although the percentage of recycled cotton to virgin cotton is low now (about 20% – recycled cotton needs virgin cotton for strength after waste cotton is shredded to into short fibres), with developments in technology the percentage will increase, reducing the demand for virgin cotton and offering a waste solution for more cotton garments.

2.4 Re-manufacturing Denim into Other Products

An alternative option to recycling denim into new garments is to 'cascade' the waste into other useful applications.

US clothing and accessories retailer GAP runs a jeans program where customer-donated denim goes to Blue Jeans Go Green, a Cotton Incorporated-sponsored program that runs denim donation drives across America. The denim is turned into UltraTouch Natural Cotton Fiber Insulation. There are also a number of similar programs in Europe that focus on creating insulation products from end-of-life denim.

Insulation products from recycled textiles can be high performing. Recovery Insulation Ltd (RI) is a social enterprise established in the UK in 2002, selling and distributing Inno-Therm a sustainable and environment friendly thermal/acoustic non-itch insulation made from recycled cotton/denim fibre. A conference paper just presented by RI, compared an insulation product made from recycled cotton acquired through a circular supply chain, with a commonly used product based on stone wool. Results indicated that the circular product exhibits lower total carbon emissions within its production life cycle compared to stone wool insulation material, which typically follows a linear supply chain route in its production life cycle.

3.0 Findings from the roundtable

3.0 The Business of Circular Denim in Australia

“You have to try to make it fun, stories about recycling make people happy. Showing people that recycling can actually be fun and that from old waste you can make beautiful products is something very positive, and I think the media is looking for positive stories, so it’s a win.”

- Bert van Son, MUD Jeans

The second half of the business roundtable was devoted to sharing visions for CE approaches to the denim and apparel industry as well as mapping the concept of circularity in this context.

Discussion among participants revealed that there is demand and a business case for circular solutions at various stages of the denim life cycle and across industries. But more work needs to be done to:

- Understand material flows and aggregate figures to get an accurate scale of the problem and areas of immediate impact/need;
- Model scenario/feasibility of different solutions for waste textile streams as an alternative to landfill and/or conduct life cycle analysis;
- Investigate economic feasibility of recycling denim, in Australia and offshore, and changes required to make this viable for manufacturers;
- Develop a pilot scale trial of denim recycling in Australia which might leverage off existing recycling infrastructure;
- Identify the initiatives that can stimulate a market supporting circular denim models at the retail, community and policy levels;
- Define what circularity means in relation to apparel and specific textile waste streams including methods to measure performance;
- Engage consumers to get an understanding of the appetite for clothing made from recycled denim and levers for changing behaviour.

3.1 Investment and Infrastructure

“The phasing of tariffs on textile, clothing, footwear and leather (TCFL) imports to Australia to zero, in the two decades preceding 2015 and the subsequent off-shoring of TCFL manufacturing operations, has seen the decimation of Australian TCFL manufacturing, infrastructure, capability and technical know-how. This circumstance is probably the single greatest barrier to effecting a circular economy denim industry in Australia because it means restoring TCFL manufacturing capability, restoring and investing in new processing plant and infrastructure”.

- Textile engineer

Australia has the technical experience, capability and knowledge to set-up and process recycled denim fibre. Participants strongly felt that this was an both an important component of the CE model, and achievable within a relatively short time-frame.

However, the textiles manufacturing industry in Australia has been largely lost over the last 20 years as manufacturing has moved offshore. Specifically, only one cotton spinner remains in Australia, and there is currently nowhere that re-processing of denim fibre could occur at a commercial scale. The CSIRO have spinning facilities that could potentially be used for sample runs only.

In order to recycle denim fibre in Australia new manufacturing equipment would need to be set up specifically for this purpose (see Appendix C).

“The people, the knowledge, the history is all here, and there are some very good people still with the technical skills that can still build these things. I would like to bring back the infrastructure that is necessary to rebuild this model.”

- Textile engineer

However, there were various views amongst participants as to whether Australia should focus on on-shoring the recycling process or consider the innovation agenda more broadly to become a leader in technology and processes. Some of the questions raised included:

- What existing skills are there in Australia that we can utilise to add value?
- What role can and should Australia play, especially as an exporter of cotton?
- Is it commercially viable to invest in infrastructure to recycle denim onshore?
- Is it commercially viable to undertake just part of the recycling process in Australia?

Some participants suggested that it might be realistic to consider other applications for reclaimed cotton fibre, that is creating products other than denim with denim waste.

Deakin University has developed a process that allows cotton fibre to be chemically separated from synthetic fibres. This technology potentially opens up new ways of recycling denim, including jeans that are of mixed fibre content and not specifically designed to be recycled. By products from this process might also be of interest commercially.

3.2 Business Leadership

One participant noted that self regulation is the “obvious next step” in regard to accelerating CE approaches where industry sets its own benchmarks around performance; along with government supporting “cleaner production”. In relation to leasing products he noted:

“Product stewardship schemes – they’re there, let’s extend them to Australia. And the logistics are already here – we can just build on that.”

He said these three factors create a lever for business to innovate and to promote “the companies that are doing good”.

Another participant suggested that it’s important to agree on a definition of circularity and establish systems for measuring performance:

“I always feel that you need to define zero... that you have clarity on what the principles are, how we interpret them and how we apply it, that’s a good starting point. The other thing is integrated performance, having an understanding of how we define performance and how we measure it.”

While there was agreement amongst participants that manufacturers and retailers need to be more proactive around product stewardship and designing for end-of-life, it was also important to ensure the “back end” infrastructure exists.

“With Nike’s first attempt, they were flooded with shoes, they didn’t know what they were doing. I believe the position in Australia is that it could be a testing ground... it would be an extremely interesting case.”

- National logistics provider

The approach taken at a retail level gives some indication of where CE principles and practices can have an impact and bring business benefits, as well as the impact of consumer behaviour. Work made publicly available by jeans brand Levi Strauss & Co., identifies issues on which it might be most material for jeans makers to focus when developing sustainability programs.

It's second life cycle assessment study, released in 2015, showed nearly 3,800 litres of water is used throughout the lifetime of a pair of jeans, cotton cultivation (68%) and consumer use (23%). Consumer care is also responsible for the most significant energy use and climate impact, representing 37% of the 33.4 kilograms of carbon dioxide emitted during the life cycle of a pair of jeans.

Levis found that by wearing jeans 10 times before washing, American consumers can reduce their water and climate impact by 77%, U.K. and French consumers by 75% and Chinese consumers by 61%.

3.3 The Community Factor

Several participants noted that younger generations are more aware of environmental impacts, and better understand their own purchasing power. This is coupled with a greater sense of the value of apparel and the wider impacts of their consumption patterns. This demand has been reflected in the development of take-back or product stewardship programs from apparel brands and retailers globally.

One participant, from a national retail chain, said their interest was in the use of organic cotton and in partnering with brands to enable take-back and 'schwopping' schemes. 'Schwopping' like that conducted by retail chains H&M and Marks & Spencer, allows customers to deposit unwanted clothing to help those living in poverty, when they make new purchases in-store.

The Australian retailer is especially interested in developing programs that have a "community" component, a point reiterated by several participants including a national charitable recycler that said any program would need to work within its "community and mission".

One participant, a waste/recycling consultant, said it's important to engage consumers during the 'use' phase of the product life cycle:

"If you can get a connection with the consumers using the product and get them purchasing back products made from it, that will make it work in the long term."

- Charitable organisation

Another participant, an ethical clothing retailer, said they had been engaging with the food industry because it has been successful in changing consumer views on food waste and "done a great job in making sustainability sexy", in particular, making it desirable for consumers to get involved in diverting waste from landfill.

4.0 Moving Forward

4.0 Considerations for Moving Forward

“We have an inkling that there is an appetite for this, we are being approached by all corporates in terms of repurposing textiles but it’s really hard to get our head around... it needs to stack up.”

- National logistics provider

In discussing next steps for moving towards a circular economy in the denim industry in Australia, participants identified the following key action points for consideration:

- Building a business case for CE approaches to denim in Australia will help to get other parties on board, including government and investors, and give direction to companies currently dealing with associated problems of waste, resource scarcity and consumer trends. A business case necessitates aggregating and analysing data related to: the type and volume of waste textiles available for recycling/repurposing; feasibility of different uses for waste textiles; explore feasibility scenarios specific to streams such as denim; analysis of end of life options for new textiles entering the market at the point of manufacture or retail; and definition baselines and targets around potential recycling/repurposing solutions.
- Define and agree on a vision for CE within and across industries - define circularity. Understanding what this model looks like, what level of performance is expected and/or desirable, and how this can be measured.
- Retailers should consider putting conditions on manufacturers and favour companies actively working towards CE models in order to accelerate and create demand for these products.
- Put leasing models into practice in order to retain ownership over materials, begin to shift consumer attitudes and educate around textile waste issues.
- Acquisition of, or access to, manufacturing infrastructure for processing and recycling denim fibre is an integral component of the CE model. While the equipment does not currently exist in Australia, the technical knowledge and ability can be leveraged.
- Create demand for recycled denim fibre through development of other products that would take advantage of existing expertise and industries in Australia that can value-add.
- Develop public discourse, education and community engagement around textile waste, resource scarcity, consumption patterns, and more ethical options for consumers.

4.1 Conclusion

By exploring opportunities and barriers in setting up a circular economy model for denim in Australia, the findings of the Better Threads roundtable discussion will pave the way to further conversations about how to not only divert all cotton products, but all other textile waste streams from landfill and indeed, capture the inherent value of those fibres to create new products.

The successful establishment of some or all circular economy practises will require the collaboration and participation of multiple stakeholders, which has potential to add value for each party in unique ways.

Appendix A

The Circular Economy

The Circular Economy goes beyond recycling as it is based around a restorative industrial system geared towards designing out waste. The goal is not just to design for better end-of-life recovery but to also minimise energy use, extraction of virgin resources, and environmental impacts. Therefore options to extend the life of products through repair, reuse and remanufacture often meet the CE aim of keeping products, components and materials at their highest utility and value at all times.

A report released by the Ellen MacArthur Foundation last year revealed that by adopting CE principles, Europe can take advantage of the impending technology revolution to create a net benefit of €1.8 trillion by 2030, or €0.9 trillion more than in the current linear development path. This would be accompanied by better societal outcomes including an increase of €3,000 in household income, a reduction in the cost of time lost to congestion by 16%, and a halving of carbon dioxide emissions compared with current levels.

It is within this context, where CE business models can contribute to the worldwide efforts towards a green economy by offering a range of benefits - from reducing waste through to promoting locally produced goods - that businesses are coming together to explore these benefits.

As the CE is a system-wide change, and about much more than one product, company, or sector, pre-competitive collaboration is essential in creating or scaling flows of materials, according to the Ellen MacArthur Foundation. It says the economics become more interesting when large volumes of material can be processed, which puts collaboration at the heart of the transition to a CE for these types of products.

Northern France Regional Council - Case Study

As an example, Northern France's Regional Council is directly fostering collaboration around textiles flows with the Textiles Recycling Valley initiative. A convention between partners was signed in June 2013 for the development of a three-year plan, with the overall goal to create profitable businesses and sustainable jobs in the textiles recycling sector.

In France, it is estimated that 600,000 tonnes of clothing, household linen, shoes and workwear is currently discarded each year, but only a quarter of that volume is currently collected. Five organisations form the core partners of the project with each bringing different skills or knowledge in convening relevant stakeholders, textile innovation, reverse logistics, materials reuse and economics. What the initiative has found is that, as well as direct reuse and recycling, one potential route for collected textiles is by "cascading" them through other applications. In this case, both insulation and filtration products are developed from recycled fibres. The Textiles Recycling Valley initiative has also created a Circular Textile Stock Exchange online to facilitate exchanges and marketing of end-of-life products, enabling the connection between buyers of secondary raw materials and waste producers.

Appendix B

MUD Jeans Case Study

MUD Jeans, known as a 'Circular Denim Brand', is a sound case study of how CE principles and practices can be applied in the denim industry. Founded in 2012 in Holland, MUD Jeans has established a business model that provides greater control over raw materials than conventional models and gives consumers a more ethical means of procuring and disposing of jeans.

CIRCULAR DESIGN:

Jeans are designed with disassembly in mind - including printed branding, removable buttons, and 100% cotton to maintain purity in the recycling process.

PRODUCE:

MUD Jeans works with mills that are BCI and GOTS certified, meaning their products are made from certified sustainable cotton. MUD are also a member of the Young Designer Programme of Fair Wear Foundation.

LEASE OR BUY:

Through MUD Jeans, customers lease or buy jeans and are incentivised to return their jeans when they are no longer in use. A repair service is also offered to maintain jeans in use and extend product life.

USE & RETURN:

Customers are encouraged to return jeans back at the end of use.

UPCYCLE:

Returned jeans that are in good condition are upcycled and sold as unique vintage pairs. The jeans are named after the former user.

RECYCLE:

The remaining jeans undergo a recycling process at a factory in Valencia (Spain) where they are shredded and re-spun. Recycled yarn is blended with virgin fibre to create recycled denim yarn (see Appendix C). This yarn is used to make new products, currently containing 25% reclaimed fibre - although some rougher yarns contain up to 80% recycled fibre - and trials are being conducted on yarns with up to 100% recycled fibre. Importantly the recycling process is transparent, providing consumers with comprehensive information about their returned jeans that enables them to make fully informed choices.

Although MUD Jeans has not received as many jeans back as initially expected, it is now accepting end-of-life jeans from other brands that contain 98% or more cotton, increasing the volume of recycled yarn. Due to the comparatively high price of organic cotton and the costs of ethically recycling and manufacturing its jeans, MUD Jeans adopted its CE model in order to create a financially sustainable and 'future proof' business, primarily by retaining control (and the intrinsic value) of its raw materials.

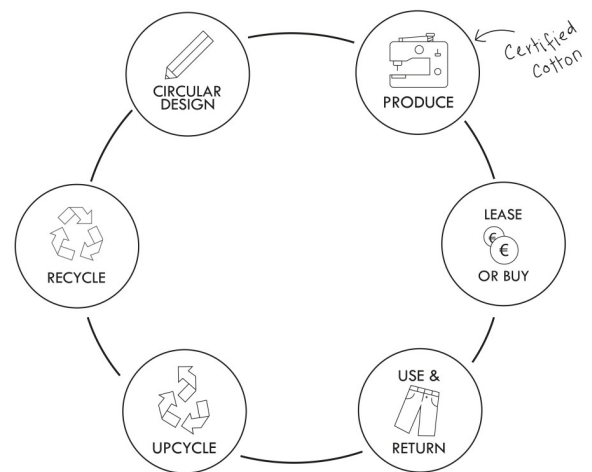


Figure 1: MUD Jeans circular business model
Source: <http://www.mudjeans.eu/about/>

Appendix C

The Technical Side of Cotton - Six Steps to Recycling Denim

(This chapter has been generously provided by textile engineer Margaret Jacobsen, Edtex Australia)

The current process steps and plant used in the manufacture of MUD Jeans are:

1. Shredding of pre-loved denim jeans and converting the denim textile into “shoddy”
2. Opening and Blending
3. Carding
4. Drawing
5. Spinning (open end spinning – a short staple cotton spinning technology)
6. Weaving

Each step utilises plant and equipment specific to a particular genre of textile technology.

The process steps and technologies are typical of current manufacturing practice on a worldwide basis, and until very recently (last three to five years), there were still facilities and the manufacturing capability to reclaim textile waste and convert it to other textile products here in Australia. Up until the early 2000's, there were numerous Australian manufacturers operating in the shoddy, spinning and weaving space and effectively servicing both domestic and export markets for textile products.

The flowchart below describes the technologies employed across the six steps that need to be re-established in order to realise a vertically integrated CE in the Australian denim industry (refer to Figure 2 overleaf).

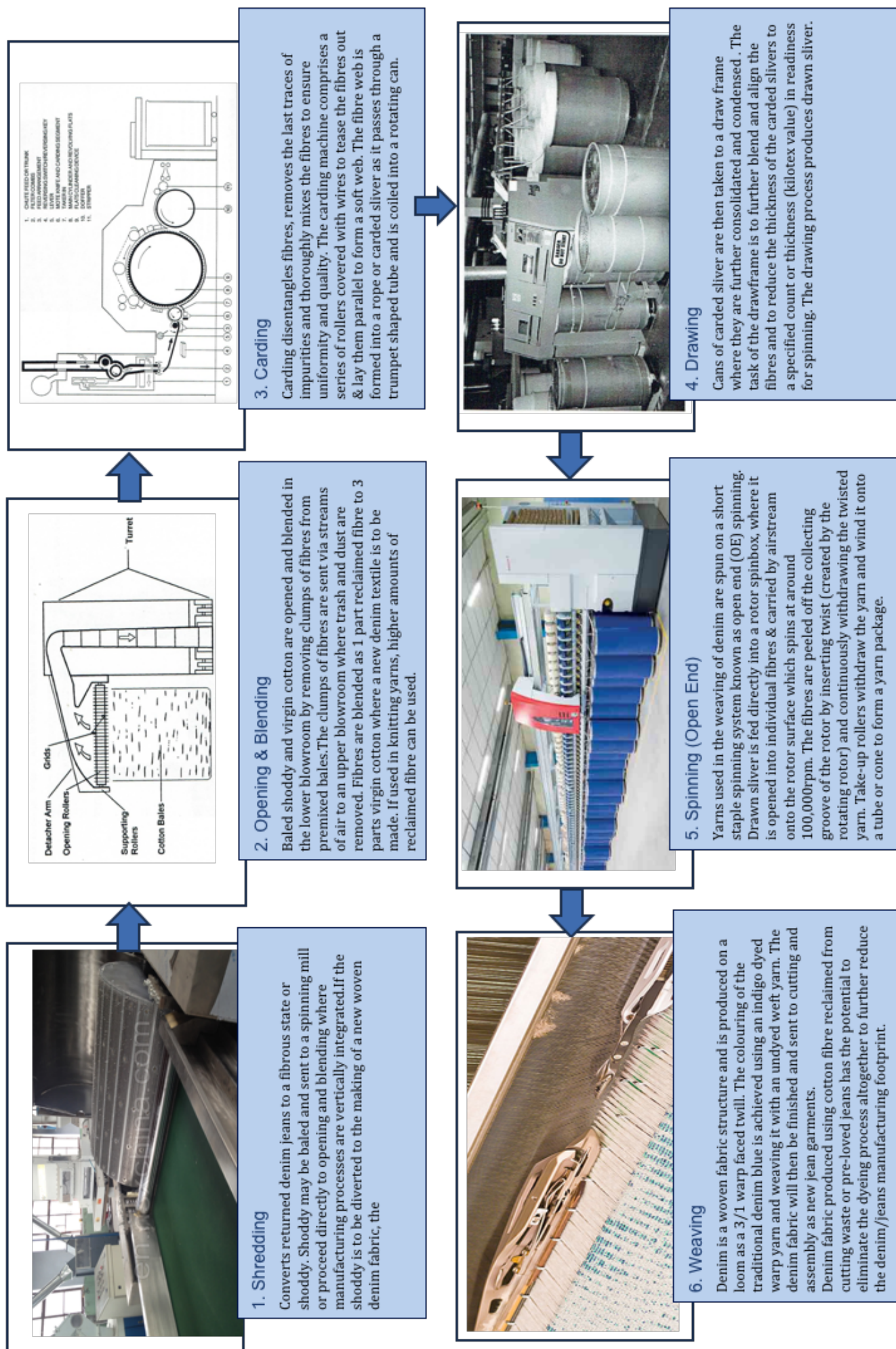


Figure 2: Six steps to reprocessing denim fibre. (c) Margaret Jacobsen, Edtex Australia.