PULP AND PAPER MANUFACTURING INDUSTRY SECTOR

IRC Skills Forecast and Proposed Schedule of Work

2018–2021

Prepared on behalf of Pulp and Paper Manufacturing IRC for the Australian Industry Skill Committee

skillsimpact.com.au

IRC SKILLS FORECAST AND PROPOSED SCHEDULE OF WORK 2018–2021

Purpose

This IRC Skills Forecast represents the latest industry intelligence and resulting schedule of work of the Pulp and Paper Manufacturing (PPM) Industry Reference Committee (IRC). It has been developed through research of national, industry data sources and ongoing input from IRC members and key stakeholders. The report is designed to provide industry intelligence to support the Australian Industry and Skills Committee's (AISC) four-year rolling National Schedule of training product development and review work.

The report is structured according to the AISC template, in four main sections:

- **Sector Overview** – examining the depth and breadth of the industry and identifying the macro environment that currently challenges and provides opportunities for the industry**.**

- **Employment** – reviewing the employment projections by the Department of Employment and outlining the current workforce profile and supply for the industry.

- **Skills Outlook** – identifying the key priority skills for the industry, key drivers and how they can benefit from improvement or development of national skills standards.

- **Proposed Schedule of Work** – establishing the scope and timeframe of proposed training package development, in line with industry priority skills.

Administrative Information

Name of Applicable Industry Reference Committee (IRC)	Pulp and Paper Manufacturing IRC
Name of Applicable Skills Service Organisation (SSO)	Skills Impact Ltd

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CONTENT

A. EXECUTIVE SUMMARY

Australia's pulp and paper manufacturing industry is a world leader in sustainability and innovation, using independently certified renewable resources and world's best practices for recycling and continuously improving its energy and water efficiency and emissions. The industry is now setting the agenda with ambitious investments in renewable energy and cutting-edge technology for consolidation and diversification.

The industry makes a significant contribution to Australia's economy and regional communities. It is highly concentrated in regional Victoria and New South Wales, dominated by a few significant businesses characterised by large-scale, vertical integration and multinational operations. It integrates many small companies that operate near capital cities in all states and territories.

Virtually every business and household in Australia uses Australia's pulp and paper products. Products include paper grades from newsprint and communication to corrugated paperboard and containers. Other value-add paper products include bags, sack and paper packing goods, a range of office, educational and personal paper stationery, and personal and family products, such as tissues, nappies, napkins, paper towels, and women's sanitary goods.

A critical growth area for the industry is packaging and converted paper product manufacturing due to the favourable trade of food items and online shopping that require shipment of goods and retail-ready packaging. Unfortunately, there has been a decline in newsprint, printing and communication paper grades as a result of digitisation.

In the last ten years, industry's workforce development and employment levels have been reflective of the sectoral activity and changes in product demand. During this time, the industry has undertaken and invested in training to upskill its workforce, developing a preference for non-formal over formal training. Primary reasons for favouring non-formal training appear to be as a result of large-scale businesses having sizeable human resource and training departments, enabling the use of own company training materials and trainers. Efficiency and productivity are paramount in most operations and allowing time for employees to do off-site training is unaffordable. When technology is upgraded, vendor or company training becomes a more efficient option for businesses to achieve a high-level productivity quickly. The reduction of government subsidies for training, the embargo of third-party delivery arrangements, and the availability of only two registered training organisations nationally that deliver pulp and paper qualifications limit businesses' capacity to choose formal training.

The report identifies that skills that support paper recycling operations, energy from biomass, chain of custody and sustainability, and processes in converted paper manufacturing are top priority skills for the industry.

Summary of Key Points in each Section

Sector overview

- The pulp and paper manufacturing industry integrates six industry sub-sectors as follows: pulp, paper and paperboard manufacturing; corrugated paperboard and paperboard container manufacturing; paper bag and other paper product manufacturing; paper stationery manufacturing; personal and family care product manufacturing; and paper product merchandising.

- The industry consists of 716 manufacturing businesses and 1,174 paper product wholesalers, employing 23,833 people. It combines few large, multinational companies with global operations and many small producers with a presence in local markets.

- Total sales turnover of the pulp and paper manufacturing sectors increased by 3.5% (or $351 million) to $10,479 billion between 2015 and 2016.

- The industry is represented by a small number of peak organisations at the national level, including industry associations, employee associations and other industry service bodies.

- Primary legislation affecting the industry includes the *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, the *Illegal Logging Prohibition Act 2012*, the *Regional Forest Agreement Act 2002,* and the *Competition and Consumer Act 2010.* The industry also adhere*s* to two voluntary forest certification schemes: the Responsible Wood Certification Scheme and the Forest Stewardship Council Scheme (FSC).

- There are no regulated occupations for this industry[1]. Through an industry requirement, operators involved in high-risk activities must have licences to perform these work functions.

- Growing global population, expansion of middle-classes (who consume more packaging and tissue paper products) and the next economic wave given by the benefits of bioenergy and bioprocessing drive significant opportunities and challenges for the industry. Some of the key challenges include:

  – availability of wood fibre, which becomes a real concern as demand develops and supply tightens

  – constant pressure from imports of tissue stock both pre-converted and ready for conversion into tissue products

  – capacity to consolidate, diversify and expand paper and paperboard production to meet the growth area of packaging and tissue paper and to generate more value-added products in niche markets via bioprocessing and utilisation of pulp and wood residues

  – continuing opposition of some groups – argued on environmental grounds – to the expansion prospects of the domestic manufacture, particularly of the pulp mills.

Employment and training

- The pulp and paper manufacturing industry workforce is aging. The proportion of employees in all the age groups over 50 years increased by 4% in 2016 when compared with 2006.

- Men constituted 66% of the total industry workforce in 2016 and women 34%.

- The proportion of people working as paper machine operators, printers, wood process workers, metal fitters, store persons and sales representatives declined considerably in 2016 when compared to 2006. The proportion of production managers, sales managers, stationary plant operators, paper machine operators and sales assistants increased.

- Employment numbers in the industry is projected to fall over the next five years.

- In 2016, there were 28 student enrolments in PPM qualifications and 138 in PPM units of competency.

Skills outlook

- Priority skills in the pulp and paper manufacturing industry over the next four years, 2018–2021, are summarised in Table 1.

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[1] Regulated occupations have legal (or industry) requirements or restrictions to perform the work. Regulated occupations require a license from, or registration by, a professional association or occupational licensing authority.

Table 1: 2018–2021 priority skills for the pulp and paper manufacturing industry.

Priority Skill	Skill Description	Drivers
Recycling and de-inking recovered paper	Skills to handle identify and separate paper grades for recycling; and operate a pulping and de-inking process for recovered paper. Knowledge of recovered paper pulping; pulp de-inking treatments; and processes and chemicals used for bleaching de-inked pulp.	Consumer awareness of environmental issues, together with growing demand for Australian-made recycled office, printing, envelope and stationery paper, and expansion of the paper packaging market; and growing investments in paper recycling operations.
Bioenergy technologies	Skills to operate equipment for power generation or cogeneration, ensure compliance with safety regulations, and perform routine maintenance to the mechanical and electrical equipment used in production. Knowledge of biofuel technologies (combustion, gasification and pyrolysis) and biomass and other waste resources suitable for biofuel and bioenergy production. Skills to manage bioenergy systems on the small or large scale; control, monitor and test emissions (to air and water); and manage ash and other residues.	Interest in bioenergy is increasing in response to concerns about growing energy costs, energy security and environmental and climate impacts associated with the use of non-renewable energy resources; The efficient use of black liquor for the generation of heat and electricity is an opportunity for Australia; further, Australian Paper is currently investing, with support from the Australian and Victorian governments, into a waste-to-energy plant based on landfill waste conversion. Co-generation is increasingly used in the industry to produce steam for the mill (heat boilers) for operating processes. The steam is also used to generate electricity.
Leadership skills in pulp and paper	High-level knowledge of pulping and papermaking processes and technical aspects; critical thinking of pulping and papermaking techniques for quality improvement; leadership skills in sustainability, quality and safety including leadership soft skills, such as problem-solving, communication, dealing with conflict and prioritisation.	Industry's imperative to provide identifiable career paths into higher education degrees (above Diploma level) and develop a workforce able to drive significant change and results for business growth, efficiency and competitiveness.
Paper product chain-of-custody and	This priority is subject to industry consultation achieved during the following AISC cross-sector	Growing demand for Australian-made recycled office, printing, envelope and stationery paper;

Priority Skill	Skill Description	Drivers
sustainability skills at all occupational levels	projects, 'Supply Chain' and 'Environmental Sustainability', and these projects' outcomes. In principle, this priority covers skills to support responsible purchases of wood/pulp raw material, and ensure environmental sustainability from the forest to the consumer.	Australia's only facility for recycling and de-inking recovered paper, commissioned by Australian Paper in 2015.
Biorefining	Skills to support operations in a pulp-mill-based biorefinery unit for biofuels, biochemicals and biomaterials. Skills to implement nanotechnology in a range of papermaking processes and production stages.	Biorefining is an attractive future development option allowing mills to produce also other value-added products such as biofuels, chemicals or materials. Growing interest for micro- and nanotechnology in current papermaking processes to improve production and paper quality.
Automated processes in converted paper manufacturing	Skills to operate current processes and technologies in paper bag, paper stationery and sanitary paper product manufacturing.	Growing demand for sanitary paper, packaging paper products and paper stationery products globally. Recent investments in paper product manufacturing, primarily for the technology upgrade, value-adding to existing processes, or product development in niches where competitive advantages are relatively secured.

B. SECTOR OVERVIEW

Sector Description

The pulp and paper manufacturing (PPM) industry integrates the value chain of forests and wood resource utilisation through six industry sub-sectors:

- pulp, paper and paperboard manufacturing
- corrugated paperboard and paperboard container manufacturing
- paper bag and other paper product manufacturing
- paper stationery manufacturing
- personal and family care manufacturing
- paper product merchandising.

In 2016, the industry included 716 manufacturing businesses and 1,174 paper product wholesalers, employing 23,833 people.[2,3] The industry contributed to the Australian economy through its manufacturing component, with a total sales turnover of $10,479 billion. This represented a 3.5% (or $351 million) increase from 2015. The industry value added (IVA) declined by 5.1% (or $139 million) to $ 2.5 billion between 2015 and 2016, and operating profit before tax (OPBT) increased by 10.7% ($55 million) to $568 million.[4]

Relevant Training Package Qualifications

The training package for the pulp and paper manufacturing sector is *PPM Pulp and Paper Manufacturing* and comprises seven qualifications and 80 units of competency (The training package currently covers job roles in the pulp, paper and paperboard manufacturing sector and part of the other industry sub-sectors.

Table *2*).

The training package currently covers job roles in the pulp, paper and paperboard manufacturing sector and part of the other industry sub-sectors.

Table 2: *PPM Training Package* qualifications.

PPM Qualifications
Qualification Level: Certificate II
Certificate II in Papermaking Operations
Certificate II in Pulping Operations
Qualification Level: Certificate III
Certificate III in Papermaking Operations
Certificate III in Pulping Operations
Qualification Level: Certificate IV
Certificate IV in Papermaking Operations
Certificate IV in Pulping Operations

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[2] ABS, 2017, Counts of Australian Businesses, including Entries and Exits, Jun 2012 to Jun 2016, Cat No 8165.0.

[3] ABS, 2016, Census.

[4] ABS, 2016, Australian Industry, 2014-15. [www] http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/8155.02014-15?OpenDocument

Qualification Level: Certificate V
Diploma of Pulp and Paper Process Management

Sector Analysis

Sub-sector description and analysis of businesses involved

Sub-sector Name	Pulp, Paper and Paperboard Manufacturing
Scope of Work	This sector comprises companies that operate mills for the production of pulp, paper and paperboard (in rolls and sheets) from purchased woodchips or recovered paper and a variety of other inputs such as clay, lime, dyes and chemical resins. Companies manufacture paper and paperboard from their own processed pulp, from purchased pulp or recovered paper. There are four primary grades of paper and paperboard: ▪ newsprint ▪ printing and communication papers ▪ packaging and industrial papers ▪ household and sanitary (tissue). Bulk paper and paperboard is supplied to paperboard packaging producers, paper product producers, printing and publishing industries, and overseas production.
Producers	Based on ABS data, the sector comprised 159 manufacturing businesses in 2016.[5] Seven significant participants with foreign ownership and large-scale and multinational operations dominate the sector:[6] ▪ Visy Industries Pty Ltd - Pulp and Paper Division (Pratt Holdings Proprietary Limited) ▪ Paper Australia Pty Ltd (Nippon Paper Group) ▪ Norske Skog Industries Australia Limited (Norske Skog Industries ASA) ▪ Asaleo Care ▪ ABC Tissue ▪ Kimberly-Clark Australia ▪ Orora Limited.
Geographical Location	The sector is concentrated in Victoria and New South Wales. ▪ Australian Paper operates the Maryvale Mill in Victoria and is the most significant pulp and paper complex in Australia. ▪ Visy's Pulp and Paper Division operates seven paper mills, with three located in Victoria, three in New South Wales and one in Queensland. The main mill is the Tumut Kraft Mill in New South Wales. ▪ Norske Skog Industries Australia operates the Albury Mill in New South Wales and Boyer Mill in Tasmania.

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[5] ABS, Counts of Australian Businesses June 2012 to June 2016, Cat No 8165.0.
[6] Enterprises are listed according to their relative market share or significance in the sector.

Automation and Digitisation	The sector features a high level of technological development and computerisation, including complex integration across multiple processes and technologies (production lines) and online systems for efficient control of the supply chain logistics. Large capital investment has been undertaken to reduce the environmental impact of the sector over the past decade through solutions involving energy efficiency, water and chemical usage efficiency, and use of alternative raw materials. The sector has also invested in biomass power generators to supply energy to their mills.

Sub-sector Name	Corrugated Paperboard and Paperboard Container Manufacturing
Scope of Work	In this sector, enterprises manufacture corrugated paperboard and containers from recycled and kraft paper or paperboard or corrugated paperboard. The product includes plain cardboard boxes and specialised packaging for various industrial and consumer goods.
Producers	There were 133 businesses in this sector in 2016.[7] Few significant players, profiled by large-scale, vertical integration and multinational operations, dominate the sector[8]: ▪ Visy Industries Pty Ltd – Packaging Division (Pratt Holdings Proprietary) ▪ Orora Limited ▪ Shute Bay Investments Pty Ltd (formerly Detmold Holdings Pty Ltd) ▪ Colorpack Limited NSW, VIC (purchased by US-based Graphic Packaging International) ▪ Oji Fibre Solutions ▪ Hannapak NSW (Purchased by US-based WestRock) ▪ New ANZPACK Services ▪ Abaris VIC.
Geographical Location	Visy operates major corrugating facilities in Brisbane, Sydney, Melbourne, Wodonga, Adelaide and Perth. Orora produces high-quality recycled packaging paper at the Botany Mill, NSW.
Automation and Digitisation	Operations use production lines supported by computerised machines and processes, including the latest printing techniques, through computer-aided design and computer aided manufacturing software (CAD/CAM).

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[7] ABS, Counts of Australian Businesses June 2012 to June 2016, Cat No 8165.0.
[8] Enterprises are listed according to their relative market share or significance in the sector.

Sub-sector Name	Paper Bag and Other Paper Product Manufacturing
Scope of Work	Producers in this sector process paper rolls and sheets into a variety of bags, sack and paper packing goods for cement, food and other industries such as retail stores, cafes and restaurants.
Producers	This sector comprised 18 businesses in 2016[9], producing for niche markets. Significant players include[10]: • Shute Bay Investments Pty Ltd (formerly Detmold Group) • Orora Limited • Pope Packaging.
Geographical Location	Producers are located in the states with more extensive populations and economic activity – NSW, VIC, QLD and SA – and the proximity of capital cities.
Automation and Digitisation	The sector, particularly larger businesses, have implemented technological changes through adoption of new equipment and the computerisation of processes with a focus on efficiency of production.

Sub-sector Name	Paper Stationery Manufacturing
Scope of Work	Producers manufacture bulk paper into a range of office, educational and personal paper stationery. The products include writing paper, filing paper products, print paper, paper label, paperboard games and toys. These products are sold to both specialist and generalist paper stationery wholesalers and retailers.
Producers	In 2016, the sector had 213 businesses with operations from very small to large.[11] Major players in this sector include[12]: • Paper Australia Pty Ltd (Nippon Paper Group) • Labelmakers Group Pty Ltd • Avery Dennison Australia Pty Ltd (US Avery Dennison Corporation)
Geographical Location	Businesses operate in metropolitan areas, close to other manufacturing industries and retail outlets in VIC, NSW, SA, WA and QLD.
Automation and Digitisation	The sector, in particular the larger businesses, have implemented technological changes through adoption of new equipment and the computerisation of processes with a focus on efficiency of production.

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[9] ABS, Counts of Australian Businesses June 2012 to June 2016, Cat No 8165.0.
[10] Enterprises are listed according to their relative market share or significance in the sector.
[11] ABS, Counts of Australian Businesses June 2012 to June 2016, Cat No 8165.0.
[12] Enterprises are listed according to their relative market share or significance in the sector.

Sub-sector Name	Personal and Family Product Manufacturing
Scope of Work	This sector includes producers that manufacture personal and family products, including tissues, nappies, napkins, paper towels, and women's sanitary goods. These products are typically sold to grocery and paper product wholesalers or directly to retailers.
Producers	In 2016, there were 45 businesses operating in this sector.[13] Large businesses with multinational operations dominate the market[14]: ▪ Kimberly-Clark Australia (Kimberly-Clark Corporation) ▪ Asaleo Care Limited (publicly-owned) ▪ ABC Tissue Products Pty Ltd ▪ Unicharm Australasia Holding Pty Ltd (Unicharm Corporation, Japan) ▪ Encore Tissue Pty Ltd
Geographical Location	The majority of sanitary paper establishments are in VIC, SA, and NSW.
Automation and Digitisation	Manufacturers and retailers are increasingly reviewing the best ways of providing products, information and services to customers; are adapting to new methods of collaborative logistics (computerised inventory control systems, tracking and reporting technologies) and digital communications.

Sub-sector Name	Paper Product Merchandising
Scope of Work	This sector operates via two primary channels: ▪ retail and trade merchants selling to the public, DIY market and builders ▪ wholesalers, manufacturers, importers and exporters. Retail and trade merchants stock a broad range of local and imported paper and paperboard. Wholesalers, manufacturers, importers and exporters sell, import and export large volumes of bulk paper and paperboard, as well as paper-based packaging, stationery and sanitary products that are distributed through the merchant sector or directly to the specialist industries.
Producers	The sector is highly fragmented, comprising of 1,174 businesses.[15] Many are small-scale paper wholesalers that service narrow geographic or product markets, and several are large-scale vertically integrated paper companies that hold a dominant position in state or national markets. Major players in this sector include[16]:

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[13] ABS, Counts of Australian Businesses June 2012 to June 2016, Cat No 8165.0.

[14] Enterprises are listed according to their relative market share or significance in the sector.

[15] ABS, Counts of Australian Businesses June 2012 to June 2016, Cat No 8165.0

[16] Enterprises are listed according to their relative market share or significance in the sector.

Sub-sector Name	Paper Product Merchandising
	▪ PagePack (merged entity of BJ Ball and KW Dogget Fine Paper, majority-owned by Japan Pulp & Paper)
	▪ Corporate Express (CE) Australia (US Staples Inc)
	▪ Kimberly-Clark Australia (US Kimberly-Clark Corporation)
	▪ Paper Australia (Nippon Paper Group)
	▪ Avery Dennison Australia Pty Ltd (US Avery Dennison Corporation)
	▪ Asaleo Care
	▪ Huhtamaki (Huhtamaki Group, Finland)
	▪ Spicers.
Geographical Location	Paper product merchants and wholesalers operate throughout Australia.
Automation and Digitisation	Manufacturers and retailers are increasingly reviewing the best ways of providing products, information and services to customers and adapting to new methods of collaborative logistics (computerised inventory control systems, tracking and reporting technologies) and digital communications.

Relevant Stakeholders

The pulp and paper manufacturing industry is represented by a relatively small number of industry and employee associations at the national level (Table 3).

Table 3: Peak industry sector organisations.

Categories
Industry Associations
Australian Forest Products Association
Australasian Pulp and Paper Industry Technical Association
Packaging Council of Australia
Employee Representative Organisations
CFMEU Forestry and Furnishing Products Division
Australian Workers' Union (AWU)
Industry R&D Services Bodies
Bioresource Processing Research Institute of Australia (BioPRIA)
Forest and Wood Products Australia Ltd
Industry Services Bodies
ForestWorks
IndustryEdge

Industry and Occupational Regulations and Standards

Industry Regulations

The pulp and paper manufacturing industry in Australia operates under regulations at both the federal and state government levels, which relate to environmental standards and industry's impact on forest resource depletion, water and the level of chemical pollution.

The federal government regulates the industry through the *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, the centrepiece of federal environmental legislation. Most investment proposals need to meet the EPBC Act requirements. In some cases, specific legislation is required to develop and operate a particular mill (i.e. the Penola Pulp Mill project was approved by the *Penola Pulp Mill Authorisation Act 2007*). In other cases, mills are approved with conditions under the EPBC Act (i.e. the federal government approval of the Gunns Bell Bay Pulp Mill in 2007 came with a requirement that Gunns develop an environmental impact management plan).

State and territory governments regulate the industry through the *Environmental Protection Act 1970* and regulations, which differ between states and territories and are monitored by state-based EPAs.

Other national legislation that directly or indirectly affects this industry includes:

- *Illegal Logging Prohibition Act 2012*
- *Regional Forest Agreement Act 2002.*

Industry producers and wholesalers are required to meet general workplace regulations and workplace health and safety regulations.

Wholesalers must also comply with the *Competition and Consumer Act 2010*, which covers relationships between all parties within the supply chain, including wholesalers, manufacturers, retailers and consumers, and promotes fair trading among them.

Also, the industry implements two voluntary forest certification schemes: the Responsible Wood Certification Scheme (RWC) and the Forest Stewardship Council Scheme (FSC), which typically require forest management practices to be more stringent than the legislation alone. Both schemes have forest management standards and chain-of-custody standards, of which the latter applies directly to this industry.

Regulated occupations in the industry

Regulated occupations have legal (or industry) requirements or restrictions to perform the work. They require a licence from, or registration by, a professional association or occupational licensing authority.

The industry utilises a wide range of regulated occupations, including plumbers, electricians, forklift drivers, crane drivers, mobile plant operators (dozers, tractors and bobcats), heavy vehicle operators (medium and heavy rigid), dogmen, riggers, scaffolders, boiler operators, power plant operators and many more. The high-risk licence is required for some of these activities.

Challenges and Opportunities in the Sector

The Australian pulp and paper manufacturing sector operates in a macro environment shaped by a range of dynamic factors related to wood fibre, markets, trade, technology and environmental challenges. The following paragraphs discuss the issues and industry's opportunities for growth pertaining to these factors.

Resources and environment

Fibre supply

Demand for wood fibre continues to grow as the global population expands and the middle-classes rise and consume more. As a result, fibre resources will become more scarce. For almost two decades, availability of wood fibre has been a real concern across the world and, as demand develops, the supply is expected to tighten.

Based on the National Plantation Inventory, Australia's wood fibre resources are predicted to grow over the next 15 years but not for all the pulp markets. The production of plantation hardwood pulplog will increase to about 13.5 million cubic metres over 2020–2034, from 4.4 million cubic metres per year in 2009–2010.[17] Conversely the supply of softwood pulplog resources will remain strained in the long term. The production has increased only marginal from 4.6 million cubic metres in 2009–2010 to about 5.6 million cubic metres per year during 2015–2019 and is expected to remain at this level until 2054[18].

Secondary fibre, including recovered paper and paperboard and residues from veneer production, contributes to the wood fibre supply, also providing opportunities to the industry.

Australia has high rates of paper recovery and utilisation, essentially providing alternative solutions to the limited pulp market. The Australian pulp and paper manufacturing industry recycled almost 74% of all paper and paperboard in 2015–2016, which exceeds that of Europe and the US. The recovered paper has become a valuable resource and is now the sole fibre source for many paper products. Recovered newsprint and packaging papers are two particular grades with high collection rates. Recycling of the office grade paper is also elevated by Australia Paper's new de-inking and recycling plant in Victoria's Latrobe Valley.

Environmental sustainability

With continuous innovation and investment, the Australian pulp and paper manufacturing industry has progressively reduced its water and energy footprint for paper and paperboard production. Pulp and paper facilities are currently using water systems that allow all mill wastewater to be reused, for example, for farm irrigation.

Several of Australia's pulp and paper mills produce baseload (continuous supply) electricity and thermal heat from renewable, biomass residues. The sector continues to examine opportunities to develop its delivery of baseload electricity to the grid.

An apparent strategic threat to the pulp and paper industry is the continuing opposition – argued on environmental grounds – to the expansion prospects of domestic manufacture, particularly of the pulp mills.[19]

A critical challenge for the industry is the volume of imported paper products and capacity for them to replace locally manufactured products. It has been identified that the greenhouse gas emissions associated with production of locally made paper and paper products (including recycled paper and products) is significantly lower than the emissions associated with imported paper products.

More than 95% of the wood fibre used in the manufacture of pulp and paper and paperboard in Australia is from forests certified by either the Responsible Wood Certification – the endorsed scheme of the Program for Endorsement of Forest Certification (PEFC) – or the Forest Stewardship Council Certification (FSC) and, in some cases, by both.

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[17] ABARES, 2013, Australia's' State of the Forests Report. [www] http://www.agriculture.gov.au/abares/forestsaustralia/sofr/sofr-2013

[18] Ibid.

[19] IndustryEdge, 2016, Fifteen20. The Overview & 2020 Outlook for Australian and New Zealand paper, paperboard, paper product and fibre supplies markets.

Business and economics

There is patchy global growth in paper and paperboard consumption. Two dominant segments – packaging and tissue markets – currently dominate growth.

The demand for packaging paper is provided by the growing global consumption of goods, online shopping, trading of food items (involving a variety of retail-ready corrugated containers and cartonboard packaging products) and manufacturing in general. These consumer trends can offer opportunities to Australian pulp and paper producers to shift production and realise growth. However, there are challenges associated with expanding paper and paperboard production.

Australia's manufacturing of converted packaging, mainly corrugated boxes, has increased solidly over the last few years despite the ongoing levels of imports. Moulded fibre imports (including egg cartons, fruit trays and medical pulp) reached a record level in 2017. Australia's cartonboard conversion sector (cereal boxes, hold six-packs of boutique beer, encase pharmaceuticals and other high-end products) has gone through rationalisation and consolidation (mergers).

Australia's tissue market is very dynamic, sustained by marketing strategies of both major retailers and manufacturers for their branded products. However, local producers are under constant pressure from imports of tissue stock, both pre-converted and ready for conversion into tissue products. The bulk of pre-converted tissue product imports consists of pre-converted toilet paper, with China being the dominant supplier. Imports of fully converted toilet tissue products have fallen recently.

Australia's demand for printing and communication paper grades declined considerably in the past and recent years. Digitisation is the disrupting factor and agent of change for the newsprint, printing and communication sectors. For a decade, there has been a continuous decline and rising input costs for printing paper; while prices remained low until 2017, when printing paper prices in the domestic market went up. Notably, print buyers have moved to lower-priced grades of paper. Demand for newsprint continues to fall on an ongoing basis and is not expected to recover. Australian catalogue paper grows relatively well when compared with other printing and communication paper grades, due to the effectiveness of catalogues as an advertising tool.

Australia's total imports of pulp were higher in 2017 when compared with the prior year. Marginally higher tissue production may be the primary driver.

Australia exports recovered paper to the rapidly growing pulp and paper industry in Asia. China has been the leading destination until recently when the volumes went down significantly. Exports to India also declined but increased to Thailand and Indonesia.

Emerging products and markets

Bioenergy and bioprocessing are considered the next economic wave or markets of the future. The attention is on facilities such as pulp and paper mills that can extract new value from fibres and residues via chemical processing.

The industry has focused on a group of bioproducts that are primarily energy related. Kraft pulp mills involving large chemical plants are already burning their pulp by-product – lignin and black liquor – to create energy for use in the mill.

Global developments suggest that a more significant and valuable output than the generation of energy is yet to be realised by bioprocessing facilities like pulp and paper mills. Considerations exist to transform chemical pulp mills into integrated forest biorefineries to produce higher value-added products such as ethanol, polymers, carbon fibres and diesel fuel in addition to the pulp. Examples of current bioprocessing developments from pulp residues deliver products such as bioplastics, biocomposites and green chemicals that can replace inorganic and non-renewable chemicals.

A biorefinery can also refine wood into the following types of products:

- cellulose, including pulp, textile fibres and nanomaterials (like nanocrystalline cellulose)
- lignin, including pellets, active carbon and emulsifiers
- hemicellulose, including base chemicals, sugars/alcohols and hydrogels
- extractives, including fatty acids and tannin.

Under certain policy conditions, and with a growing demand for bioenergy and products made of dissolving pulp and nanocellulosic fibres, the industry has the opportunity to develop into a producer for new, niche markets and achieve higher resource utilisation and improved financial results.

Technology

Many pulp and paper manufacturing industry investments have focused on process improvement, efficiencies and refinements, mainly to serve small markets for traditional pulp, paper and paperboard products.

Other industry investments are substantial and pursue consolidation and diversification into related areas, including biomass electricity generation. In these cases, there is a need to be on an efficient scale and directly linked to resource access.

As the increasing demand for cartonboard appears to be inevitable. Mill conversions from newsprint to cartonboard production represents an opportunity for some businesses. However, investment in a new paper machine to produce from one grade to the next can quickly become challenging, considering that conversions also contribute to a tightening of the market.

Globally, there is considerable interest from companies operating in the paper and paperboard industry for biomass electricity generation. Global examples include Marubeni Corporation through their new joint venture with Kansai Electric Power Co. Inc (KEPCO) to convert the power station from oil-burning to woody-biomass fuelled; and Nippon Paper Group who managed to boost biomass production per unit area of their Brazil-based plantation, thus increasing the amount of biomass available to feed power generation.

Domestically, Australia Paper is currently undertaking a waste-to-energy feasibility study assessing the opportunities for installing an energy facility based on general municipal waste at the company's Maryvale Mill. This indicates that there are opportunities to control the high energy costs through the production of energy and other products from previously under-utilised resources, including both pulp and paper and municipal waste.

C. EMPLOYMENT AND TRAINING

Employment Update

Industry's employment level, now and ten years ago, is reflective of the decline in the pulp and paper production activity, particularly for newspaper, book and magazine products, due to the proliferation of digital technology and consumers' shift from printed reading materials to digital media accessed on devices such as tablet computers. Consumer awareness of environmental issues and the trend towards paperless offices have also limited sales of traditional A4 office paper. Reduced consumption of paper has contributed to falling domestic production activity and workforce levels.

Total and state-based employment

Based on the 2016 Census, the Australian pulp and paper manufacturing industry employed 23,833 people in 2016 (see Figure 1). About 85% of these were employed full time.[20]

Paper product wholesaling, corrugated paperboard manufacturing and paper stationary manufacturing were the most significant industry sub-sectors by employment, representing just under three-quarters of the industry. Pulp, paper, paperboard and sanitary paper products were the following largest sub-sectors.

About 70% of the industry employment is concentrated in Victoria and New South Wales.

Figure 1: Industry employment by sub-sectors and states and territories, 2016.
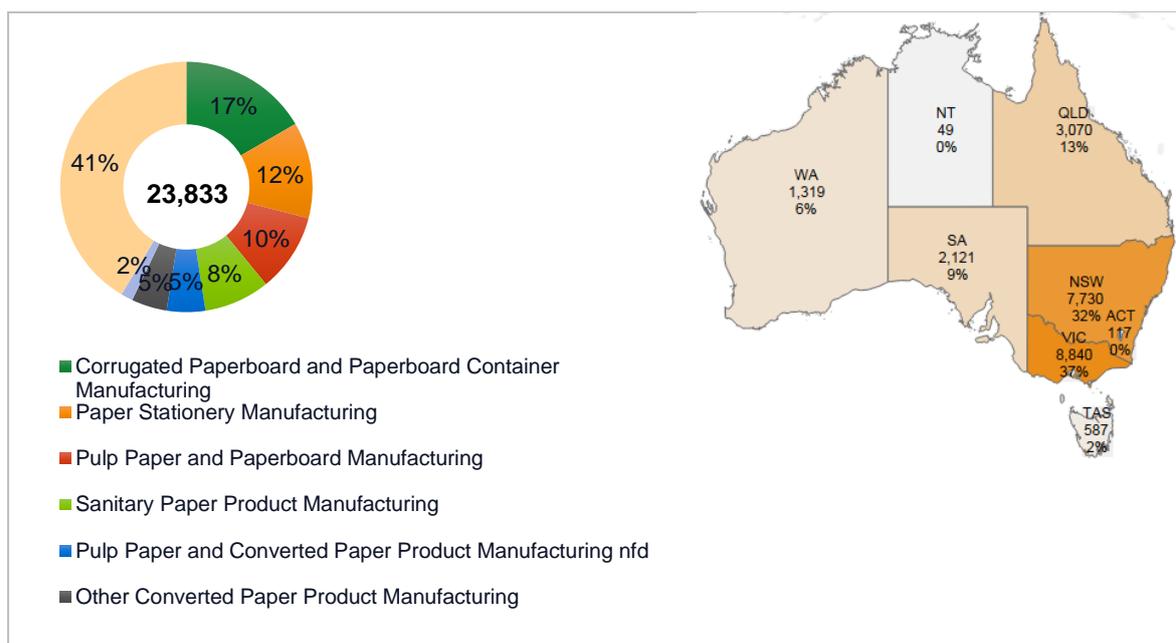
Note: 'Nfd' in this and next figures stands for 'Not further defined' codes, which ABS uses to process incomplete, non-specific or imprecise responses for the most detailed level of a classification. Nevertheless, they contain enough information to allow them to be coded to a higher level of the classification structure.

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[20] All employment data in this report is sourced from the ABS Census datasets via TableBuilderPro.

IRC Skills Forecast and Proposed Schedule of Work 2018–2021

Changes in employment, 2006–2016

Total employment in the pulp and paper manufacturing industry declined by 33% over a ten-years period, from 35,731 employees in 2006 to 23,833 employees in 2016. Considerable reductions occurred across most industry sectors, but particularly in pulp, paper and paperboard manufacturing (51%) and paper stationery manufacturing (49%) (Figure 2).

Other converted paper product manufacturing, including adhesive paper label, wallpaper and moulded paper product (such as egg trays or cartons), was the only industry sector with a favourable employment growth (82%) over the ten-year period.

Figure 2: Changes in employment 2006–2016.
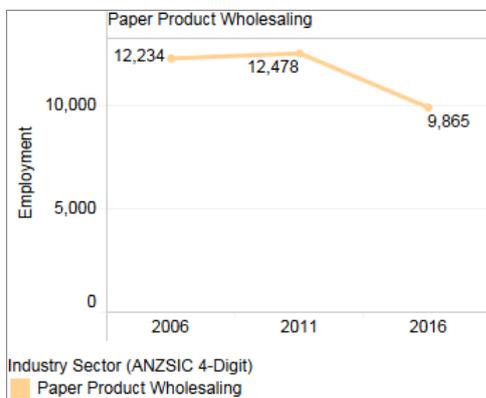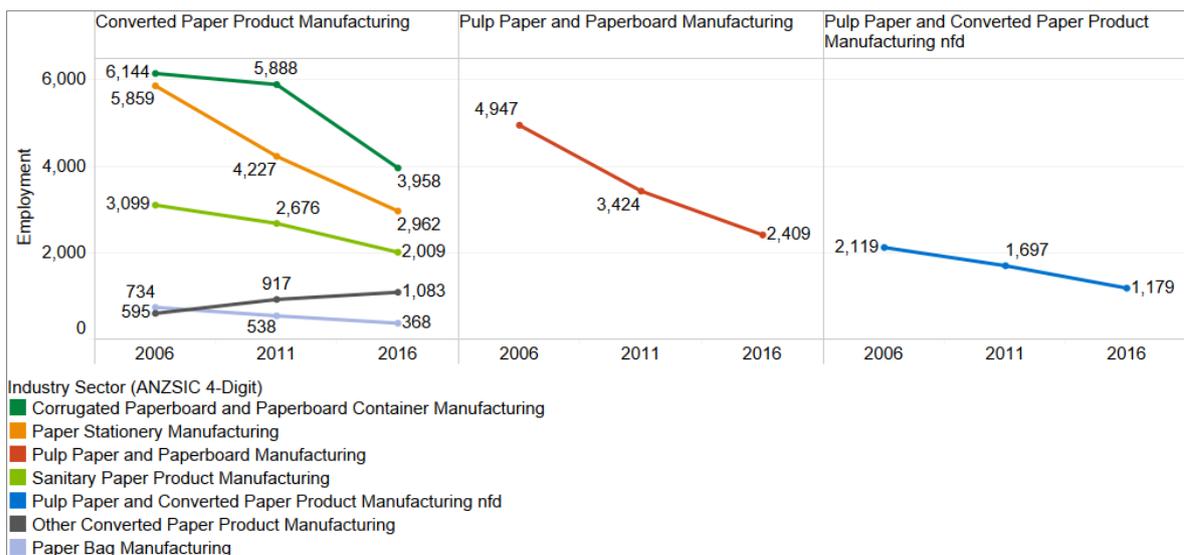
Gender composition of the workforce

In 2016, of the total industry employment, men constituted 66% and women 34%. From 2006 to 2016, women's participation in the pulp and paper industry increased by 2% (Figure 3).

The pulp, paper and paperboard manufacturing sub-sector employed a higher proportion of men in 2016 (86%) when compared with the other industry sub-sectors (Figure 4).

Between 2006 and 2016, women's participation declined by up to 5% (as % of total employees per sector) in some industry sub-sectors and remained relatively stable in other industry sub-sectors. The largest fall (5%) in women's participation was recorded for pulp, paper and paperboard manufacturing, while the most substantial growth (2%) was in paper product at wholesaling.

Figure 3: Industry employment by gender, 2006–2016.
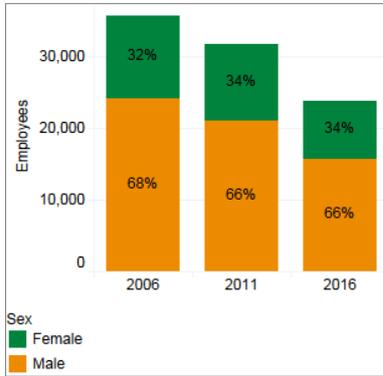
Figure 4: Industry employment by gender and sector, 2016.
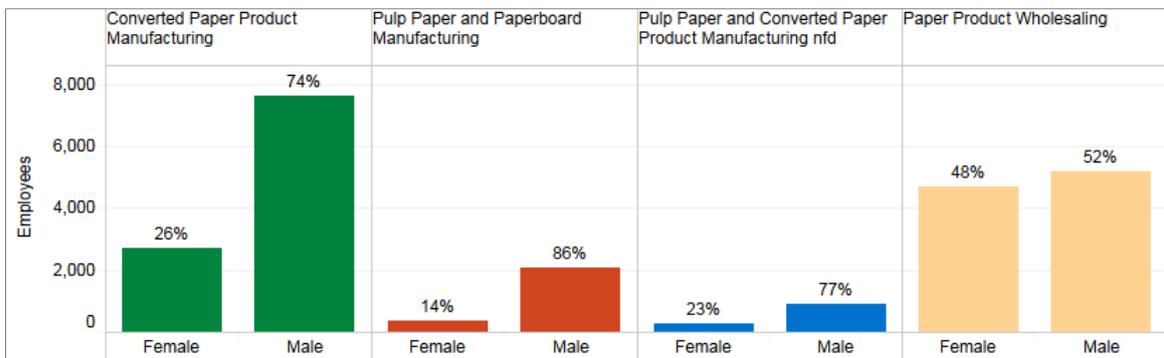
Age levels of the workforce

The industry workforce is aging. The proportion of the workforce in all the age groups over 50 years increased by 4% in 2016, when compared with 2006 (Figure 5). Conversely, the proportion of the workforce in the age groups 20 to 29 and 30 to 39 declined by 2% and 6% respectively.

The age distribution of the workforce differs slightly among the industry sub-sectors. In 2016, the workforce in converted paper product manufacturing was younger than in pulp, paper and paperboard manufacturing (Figure 6).

Figure 5: Industry employment by age level, 2006–2016.
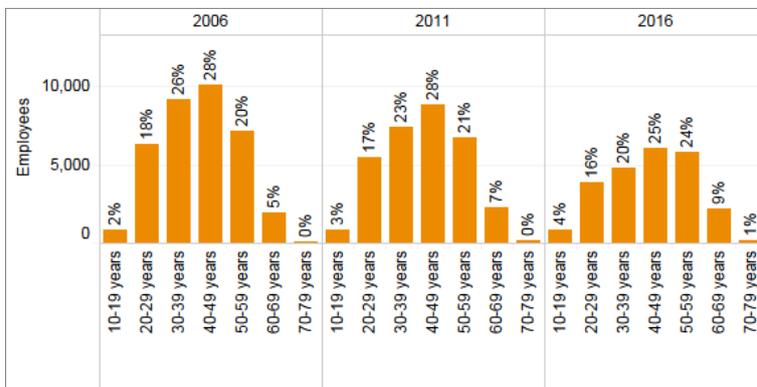
Figure 6: Industry employment by age level, 2016.
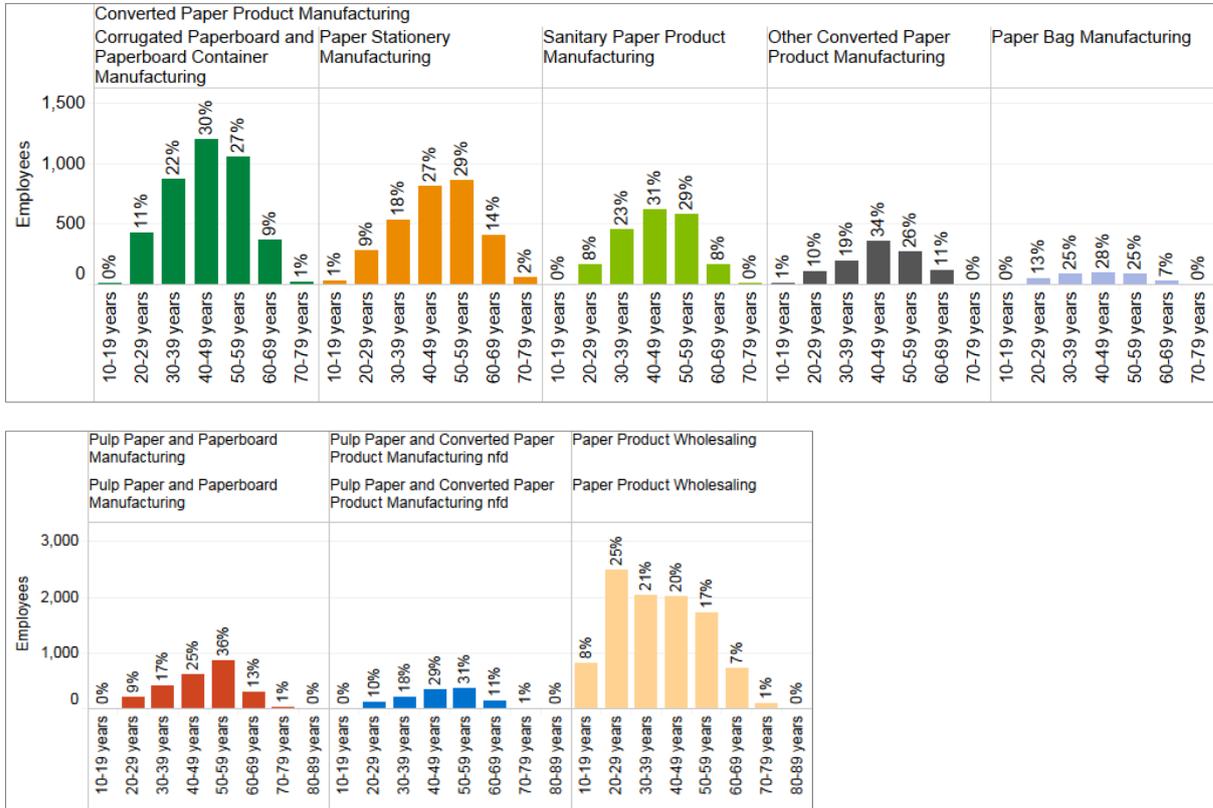
Changes in occupation of employment, 2006–2016

The most common occupation in the industry is currently sales assistants. It represented 12% of the total industry employment in 2016 and experienced a 7% growth from the 2006 level. Other main occupations, such as store persons, paper processing machine operators, printers, sales representatives and stationary plant operators, declined slightly.

The following sections cover occupational changes at the industry sector level.

Converted paper product manufacturing

The main occupations of employment in the converted paper product manufacturing sector are printers, paper and wood processing machine operators, forklift drivers, production managers, packers, other stationary operators and sales representatives. Other occupations include sales managers, store persons, metal fitters and administrative personnel.

The proportion of people working as paper machine operators decreased by 2% from 2006 to 2016, while the proportion of production managers and sales managers each increased by 2% (Figure 7).

Figure 7: Relative employment by occupations in converted paper manufacturing, 2006 and 2016.
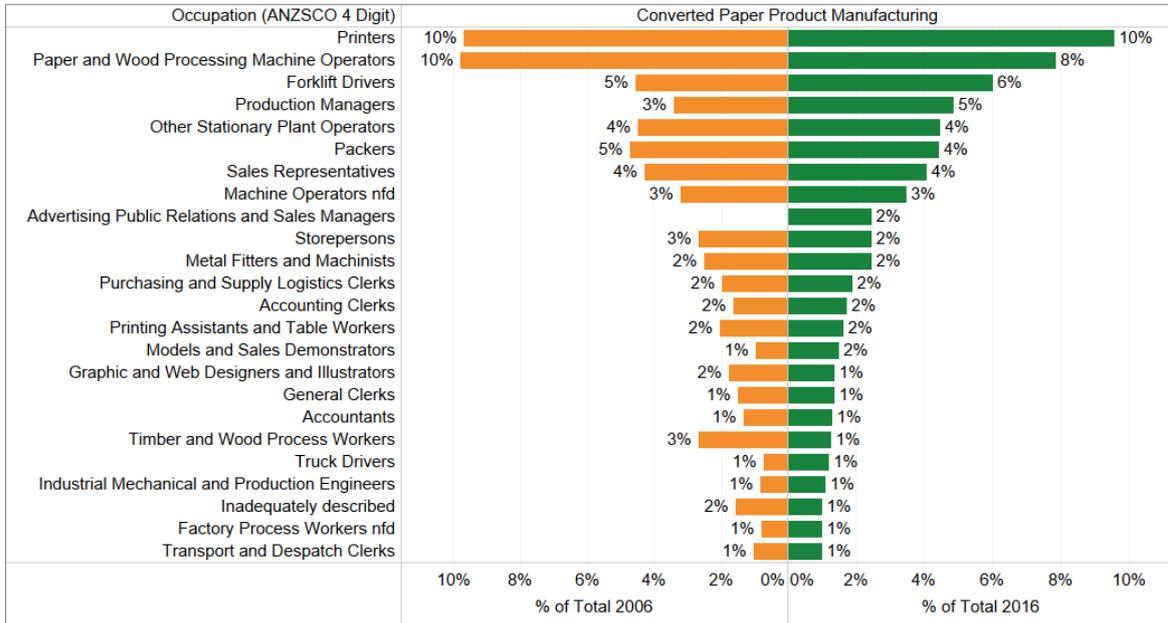
Pulp, paper and paperboard manufacturing

This industry sector employs predominantly stationary plant operators, timber and wood process workers, metal fitters, paper and wood processing machine operators, forklift drivers and production managers. From 2006 to 2016, the proportion of people working as stationary plant operators and production managers increased by 2%. In opposition, the proportion of printers fell by 3% (Figure 8).

Figure 8: Relative employment by occupations in pulp, paper and paperboard manufacturing, 2006 and 2016.
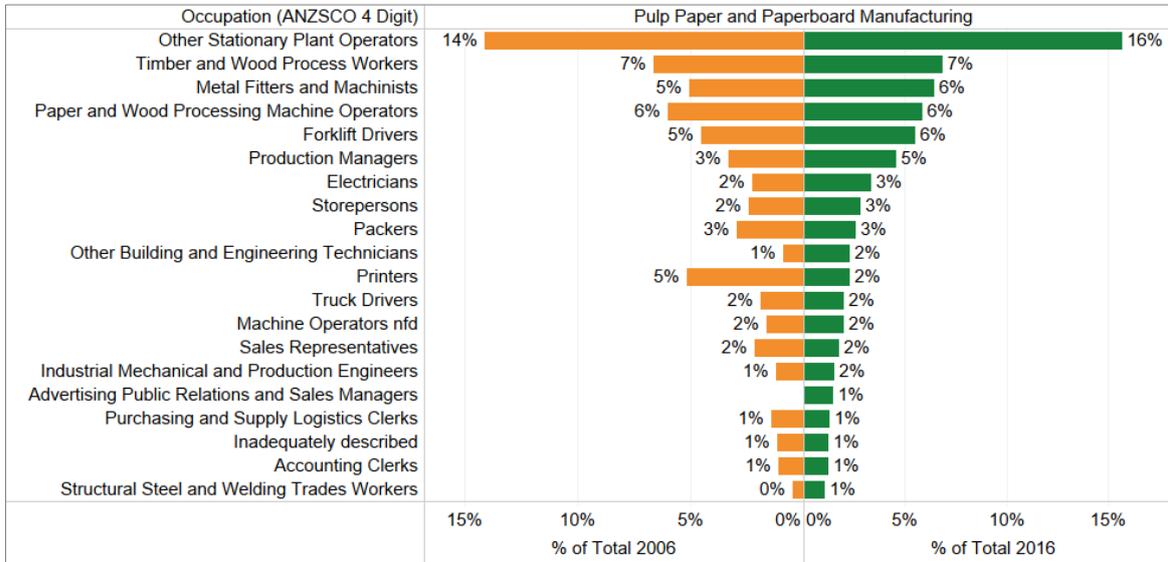
Pulp, paper and converted paper manufacturing

This sector experienced greater occupational changes during 2006 and 2016. The proportion of paper machine operators and production managers increased by 3% and 2% respectively. On the

other hand, the proportion of wood process workers, metal fitters and printers decreased by up to 3% (Figure 9).

Figure 9: Relative employment by occupations in pulp, paper and converted paper manufacturing, 2006 and 2016.
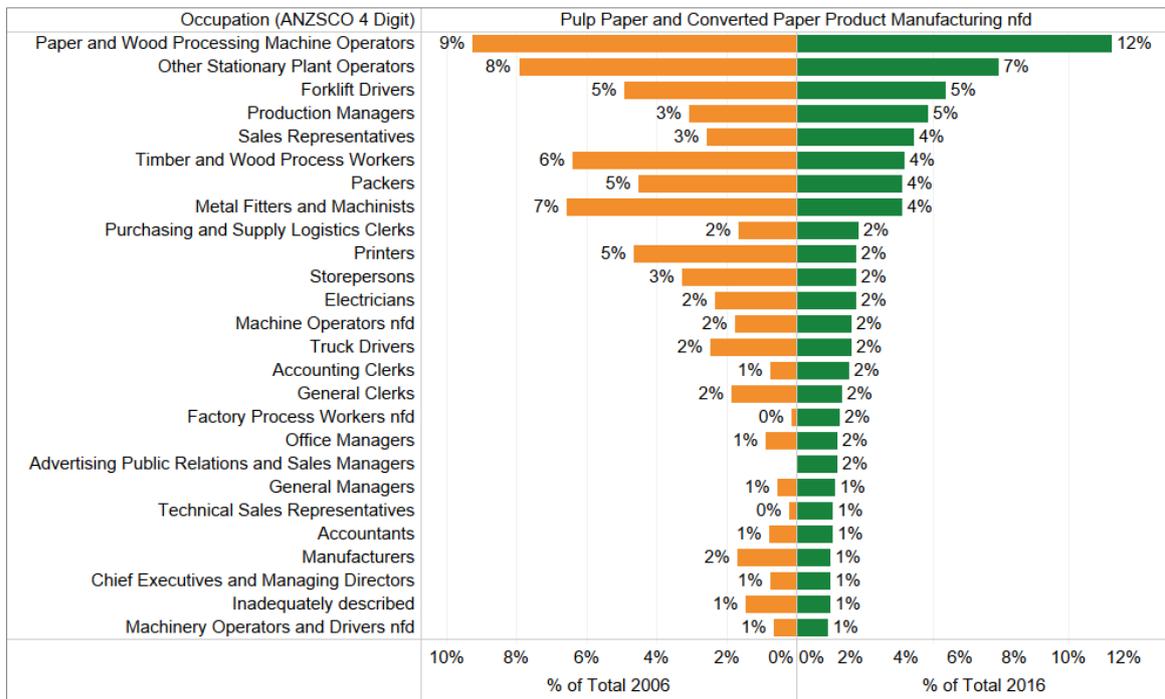
Paper product wholesaling

The primary occupations in the paper product wholesaling sector are sales assistants, store persons and sale representatives. Other occupations include retail managers, shelf fillers and purchasing and logistics officers. From 2006 to 2016, the proportion of sales assistants increased by 14% while the proportion of store persons and sales representatives decreased by 4% and 5% respectively (Figure 10).

Figure 10: Relative employment by occupations in paper product wholesaling, 2006 and 2016.

Occupation (ANZSCO 4 Digit)	Paper Product Wholesaling % of Total 2006	% of Total 2016
Sales Assistants (General)	13%	27%
Storepersons	12%	8%
Sales Representatives	11%	6%
Retail Managers	3%	4%
Shelf Fillers	1%	4%
Purchasing and Supply Logistics Clerks	5%	4%
Checkout Operators and Office Cashiers	1%	3%
Advertising, Public Relations and Sales Managers		3%
Forklift Drivers	2%	2%
Models and Sales Demonstrators	2%	2%
Accounting Clerks	2%	2%
Truck Drivers	1%	2%
General Clerks	2%	2%
Advertising and Marketing Professionals	1%	1%
Delivery Drivers	1%	1%
Importers, Exporters and Wholesalers	2%	1%
Accountants	1%	1%
Supply, Distribution and Procurement Managers		1%

Employment Outlook

The Department of Employment[21] estimates that total employment in the pulp and paper manufacturing industry will decline by 3.8% over the five years to 2022 (Table 4).

Table 4: Department of Employment Industry Projections – five years to May 2022.[22]

Industry Sector	Employment Level	Employment Projections		
	Nov 2017	Nov 2022	Growth	
	('000)	('000)	('000)	(%)
Pulp, paper and converted paper product (nfd)	5.4	5.2	-0.2	-4.2
Pulp, paper and paperboard manufacturing	3.7	3.3	-0.3	-9.2
Converted paper product:	11.8	11.6	-0.2	-1.9
Corrugated paperboard and paperboard container				
Paper bag				
Paper stationery				
Sanitary paper product				
Total	**20.9**	**20.1**	**-0.8**	**-3.8**

Training Update

Industry undertakes significant training and workforce development activities at the business level. Most of the time, the training is informal and/or non-formal. Formal training is mainly completed for licenced occupations.

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[21] The Department of Employment's projections are based on the forecasts and projections set out in the Mid-Year Economic and Fiscal Outlook (MYEFO).

[22] Department of Employment, 2016, *Industry Employment Projections – Five Years to May 2022*. [www] http://lmip.gov.au/default.aspx?LMIP/EmploymentProjections

IRC Skills Forecast and Proposed Schedule of Work 2018–2021

Industry's preference for non-formal training is based on a number of reasons, described below.

Large businesses, who previously had sizeable human resource and training departments, use own company training materials and trainers. Most other companies design internal training programs based on qualifications and units of competency from the *PPM Pulp and Paper Manufacturing Training Package.*

The decline in production activity and workforce levels over the last few years have shifted the focus from workforce development to new business models. Statistics also show that the industry workforce is aged, being more ready for retirement than upskilling. Generally, the new generations are exposed to the need for professional development. Industry capacity to attract younger people remains a challenge. There is a perceived view among younger generations that pursuing a career and qualification in the pulp and paper manufacturing sector does not compare with a trade profession and its opportunities for the future.

Financial performance has always been a top priority for pulp and paper businesses and allowing time for employees to undertake off-site training is regarded as unaffordable.

Pulp and paper manufacturing businesses undertake constant technology upgrades; being able to run and operate these technologies quickly is critical. In this case, vendor or company training provides the best option to support the skill needs promptly, when they are actually needed, as opposed to on a deferred basis when skill standards become available.

Other factors contributing to the declining uptake of formal specialised training in the industry include the reduction of government-funding programs for training, the embargo for third-party delivery arrangements, and availability of only two registered training organisations nationally with PPM qualifications on scope.

Number of student enrolments

In 2016, there were 28 enrolments in PPM qualifications and 138 in PPM units of competency (Table 5). TAFE attracted all the enrolments in qualifications and 66% of student enrolments in the units of competency. Tasmania recorded most students for both qualification and subject enrolments.

Table 5: Distribution of student enrolments by state of residence, 2016.[23]

State	Enrolments	
	PPM qualifications	**PPM units of competency**
TAS	25	65
VIC	5	15
NSW	0	46
Not Known	0	2
Total	28	138

Currently, there are two registered training organisations with PPM training components in scope, servicing the Australian pulp and paper manufacturing industry sector - Box Hill Institute in Victoria and Riverina Plant Operators Schools in NSW.[24]

Trends in enrolments

Enrolments in both PPM qualifications and units of competencies trended downwards between 2010 and 2016 (Figure 11).

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[23] All training data is sourced from NCVER VOCSTATS database.
[24] training.gov.au

Figure 11: Enrolments in PPM qualifications (a) and units of competency (b), 2010–2016.

(a)

(b)
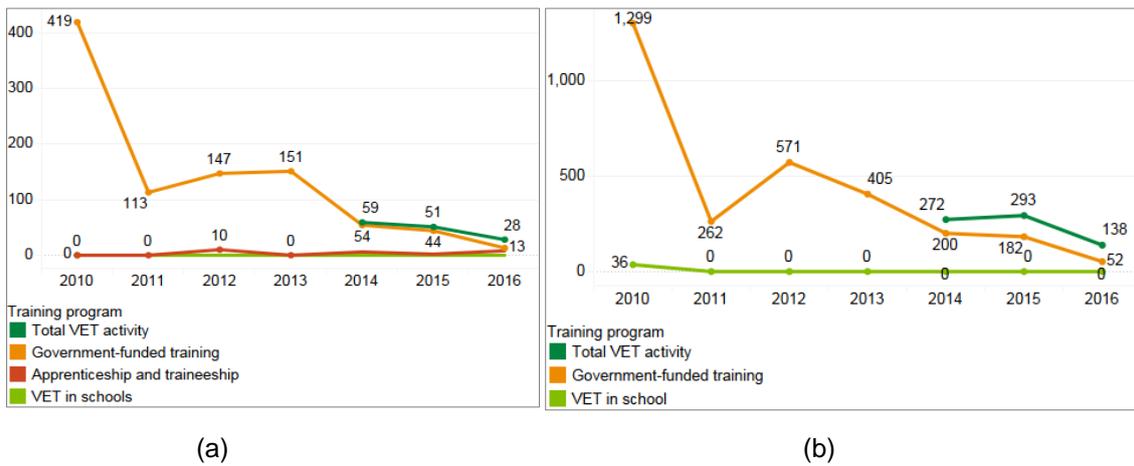
Table 6: Qualifications with no enrolments.

Year	Qualification Name
2016	Certificate II in Pulping Operations
	Certificate II in Papermaking Operations
	Certificate IV in Papermaking Operations
	Certificate IV in Pulping Operations
	Diploma of Pulp and Paper Process Management

D. SKILLS OUTLOOK

This section identifies the priority skills needs in the pulp and paper manufacturing industry over the next four years (2018–2021), as established by the Industry Reference Committees through an analysis of new and estimated future demands placed upon the industry.

The section focuses on the skills needs that can benefit from improvement or development of the national skills standards as opposed to skills shortages (positions difficult to fill). The latter is outside the scope of this report and are typically addressed through other mechanisms such as industries' workforce strategic plans and governments' market adjustment mechanisms, designed to balance the supply and demand for a skilled workforce.

Industry Priority Skills

The 2018–2021 outlook for skills needs and priorities in the pulp and paper manufacturing sector is shaped by a range of development trends and factors as outlined below.

Priority Skill 1	Skill Description
Recycling and de-inking recovered paper	This project will review and develop new units of competencies to support the recovered paper and cardboard processing, including pulp de-inking and bleaching processes for high- and medium-grade paper products.

Required skills include:

- Ability to operate technology and processes to handle, identify and separate paper grades for recycling; and conduct a pulping and de-inking process for recovered paper.

- Knowledge of recovered paper pulping (techniques to produce pulp slurry and remove contaminants); pulp de-inking treatments to remove the ink and their function; and processes and chemicals used for bleaching de-inked pulp.

Relevant Occupations

Operators, technicians, production specialists, and production managers.

Drivers

Consumer awareness of environmental issues, together with a growing demand for Australian-made recycled office, printing, envelope and stationery paper, and market expansion for paper packaging, has provided local paper and cardboard companies, such as Visy Industries, Amcor, Australian Paper and Norske Skog, with the opportunity to extensively invest in recycling operations.

Australian Paper's recovered paper recycling and de-inking facility, commissioned to process recovered office paper into recycled copy paper, envelope and printing paper in 2015, is the most recent, significant industry investment.

Training Package Solutions

Development of about three new units at AQF levels 3 and 4 as follows:

- Understand fundamentals of recycling and de-inking recovered paper for papermaking

- Operate a pulping and de-inking process for recovered paper

- Operate technology and process to handle, identify and separate paper grades for recycling.

The new units will be integrated as elective units in the specialisation area in Certificates III and IV in Pulping Operations.

Priority Skill 2	Skill Description
Bioenergy technologies	This priority covers skill requirements to turn residual waste from pulp and paper manufacturing operations and other sources of waste into energy, which in turn helps power paper mills. Skills requirements include:

- Ability to operate equipment for power generation or co-generation (heat/convert biomass using automation and control systems, calculate and load biomass feedstock), ensure compliance with safety regulations, and perform routine maintenance to the mechanical and electrical equipment used in production.
- Knowledge of biofuel technologies (including combustion, gasification and pyrolysis) and biomass resources suitable for biofuel and bioenergy production.
- Ability to manage bioenergy systems on small or large scale, apply environmental considerations (including control, monitoring and testing of emissions to air and water) and management of ash and other residues.

Relevant Occupations

Bioenergy/biomass plant operator, technicians, and managers.

Drivers

Interest in bioenergy is increasing in response to concerns about growing energy costs, energy security and environmental and climate impacts associated with the use of non-renewable energy resources.

The efficient use of black liquor and other sources of waste for the generation of heat and electricity is an opportunity for Australia. Australian Paper is currently investing, with support from Australian and Victorian governments, into a waste-to-energy plant, based on landfill waste conversion.

Co-generation is increasingly used in the industry to produce steam at the mills via heat boilers for operating processes. The steam is also used to generate electricity. Co-generation increases the efficiency of a mill by reducing the consumption of electricity from the grid. Co-generation of heat offers opportunities to reduce other impacts, such as waste disposal costs.

Training Package Solution

Review of units at AQF levels 2, 3 and 4 to update specific skills and aspects as determined through industry consultation.

Development of new units at AQF levels 2, 3 and 4 in timber processing to cover the following:

- Operate equipment to heat/convert biomass using automation and control systems

- Calculate and load biomass feedback for power generation/co-generation

- Apply compliance with safety and environmental regulations to bioenergy conversion technologies

- Apply technical knowledge about a range of bioenergy conversion technologies

- Manage bioenergy systems at small or large scale.

The new units will be integrated as elective units in the specialisation in Certificates II, III, and IV in Pulping and Papermaking Operations.

Priority Skill 3	Skill Description
Leadership in pulp and paper	This priority covers requirements for high-order thinking skills in pulping and papermaking operations, including:

- high-level knowledge of pulping and papermaking processes and technical aspects

- critical thinking of pulping and papermaking processes for quality improvement

- leadership skills in sustainability, quality and safety

- leadership soft kills including problem solving, communication, dealing with conflict and prioritisation.

Relevant Occupations

Pulp and paper machine operators, technicians, production specialists, and production managers.

Drivers

Industry's imperative to provide identifiable career paths into higher education degrees (above Diploma level) and develop a workforce able to drive significant change and results for businesses growth, efficiency and competitiveness.

Training Package Solutions

Development of new units at AQF levels 5 and 6 for operations within both pulping and papermaking environments, as follows:

- Lead and manage a team to participate in sustainability, quality and safety audits of pulping and papermaking operations

- Lead and manage a team to implement workplace processes in pulping and papermaking operations

- Identify specific hazards

- Develop workplace policies.

The new units will be integrated as elective units in the specialisation area of Certificate IV and Diploma for Pulp and Papermaking Operations.

Development of two skill sets as follows:

- Specialist Papermaker

- Specialist Pulping Operator.

Priority Skill 4	Skill Description
Paper product chain-of-custody and sustainability skills at all occupational levels	This priority skill is subject to industry consultation achieved during the following AISC cross-sector projects, 'Supply Chain' and 'Environmental Sustainability', and these projects' outcomes. In principle, this priority skill aims to cover skills requirements to support responsible purchases of wood/pulp raw material, ensure environmental sustainability from the forest to the consumer, including all successive stages of processing, manufacturing, distribution and recycling of post-consumer waste into a product. Skills requirements include:

- knowledge of and ability to interpret and implement chain-of-custody and sustainability standards

- ability to establish, achieve and maintain the chain-of-custody system and other sustainability accounting standards regarding the broad range of requirements, including environmental sustainability (greenhouse gas emissions, air quality, energy management and water management), fibre sourcing and recovery

- ability to produce chain-of-custody and sustainability documentation and conduct calculations involved in standards

- ability to identify Critical Control Points (CCP)

- knowledge about the audit process flow, chain-of-custody certification and accreditation for environmental standards

- ability to source and evaluate suppliers.

Relevant Occupations

Pulp and paper machine operators, technicians, production specialists, and production managers.

Drivers

Paper manufacturing has been perceived as an environmentally adverse process. The industry has adopted sustainability standards and developed

policies and practices to guarantee sustainability throughout the entire supply chain and improve public perception.

The primary drivers for sustainability policies and practices include the protection of reputation and specific market demands. Governments, large public corporations, such as Wesfarmers and Woolworths, and end-customers require evidence that the products they are purchasing were sourced from sustainable wood fibre.

Competitive advantage and pressure from environmental non-government organisations are also drivers for the industry to demonstrate chain-of-custody certification and legality assurance based on sustainability.

Training Package Solutions

Review of units at AQF levels 3, 4 and 5 in pulping and papermaking operations to update specific skills and aspects as determined through industry consultation

Development of new units at AQF levels 3, 4 and 5 for operations within both pulping and papermaking environments, as follows:

- Work within chain-of-custody and sustainability processes

- Monitor chain-of-custody and sustainability processes

- Audit chain-of-custody and sustainability processes

- Manage chain-of-custody sustainability processes.

The new units will be integrated as elective units in specialisation areas of Certificates III, III, IV in Pulping and Papermaking Operations and Diploma of Pulp and Papermaking Process Management.

Priority Skill 5	Skill Description
Biorefining	This priority covers skill requirements to support operations in a pulp-mill-based biorefinery unit for biofuels, biochemicals and biomaterials. An emerging skill need is also the ability to implement nanotechnology in a range of papermaking processes and production stages, including wet-end papermaking, calendering, and coating of paper and packaging materials.

Relevant Occupations

Operators, technicians, production specialists, and production managers.

Drivers

Biorefineries are an attractive future development option for the pulp and paper industry, allowing mills to produce not only pulp or paper, but also other value-added products such as biofuels, chemicals or materials.

There is also a growing interest in micro- and nanotechnology in current papermaking processes to improve production and paper quality. Examples include nanocoating, allowing mills to produce higher, more consistent quality of paper; nanotechnology employed in the production of packaging materials for security, counterfeiting, safety and anti-microbial

uses and in the production of anti-bacterial paper, tissue paper and newsprint.[25]

Training Package Solutions

Development of new units at AQF levels 2, 3, 4 and 5 within both a papermaking and pulping environment, as follows:

- Understanding of nanotechnology processing

- Prepare and start-up nanotechnology processes

- Monitor and control nanotechnology processes

- Shut down nanotechnology processes

- Troubleshoot and rectify nanotechnology processes

- Manage nanotechnology processes.

The new units will be integrated as elective units in specialisation areas in Certificates II, III, III, IV in Pulping and Papermaking Operations and Diploma for Pulp and Paper Process Management.

Priority Skill 6	**Skill Description**
Automated processes in converted paper manufacturing	Knowledge of and ability to operate current processes and technologies in paper bag, paper stationery and sanitary paper product manufacturing.

Relevant Occupations

Papermaking machine operators, technicians, production specialists, and production managers.

Drivers

Growing demand for sanitary paper, packaging paper products and paper stationery products globally due to fast global population growth, rapid development of the online shopping industry and increasing living standards in Asia, South America and Africa.

Increasing targets for efficiency, productivity and innovation in paper product manufacturing.

Recent investments in paper product manufacturing, primarily for the technology upgrade, value-adding existing processes or product development in niches where competitive advantages are relatively likely. Organisations need to upgrade skills of workers in line with investment in new technologies.

Training Package Solutions

Review of units at AQF levels 2, 3 and 4 in pulp and papermaking operations to update specific skills and aspects as determined through industry consultation.

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[25] RISI, 2011, Three things you need to know about nanotechnology in papermaking. [www]
http://technology.risiinfo.com/mills/global/three-things-you-need-know-about-nanotechnology-papermaking

Development of new units at AQF levels 2, 3, 4 and 5 within a papermaking environment, as follows:

- Understand converted paper manufacturing processes

- Prepare and start-up converted paper manufacturing processes

- Monitor and control converted paper manufacturing processes

- Shut down converted paper manufacturing processes

- Troubleshoot and rectify converted paper manufacturing processes

- Manage converted paper manufacturing processes

- Manage innovative thinking and practice in the pulp and paper manufactured products industry

- Manage pulp and paper industry research

- Lead pulp and paper industry innovative thinking and practice

- Initiate and lead a pulp and paper industry innovation.

The new units will be integrated as elective units in the specialisation area of AQF levels 2, 3, 4 and 5 for pulping and papermaking processes.

Industry Priority for Generic Skills

Industry Reference Committees were consulted on ranking the generic skills priorities for the industry from a list provided by the Department of Education and Training. Table 7 outlines the advice received.

Table 7: Industry generic skills ranking by priority.

Rank	Generic Skill
1	**Learning agility/Information literacy/Intellectual autonomy and self-management skills** Ability to identify a need for information. Ability to identify, locate, evaluate, and effectively use and cite the information. Ability to discriminate and filter information for importance. Ability to do more with less. Ability to quickly develop a working knowledge of new systems to fulfil the expectations of a job. Ability to work without direct leadership and independently.
2	**Design mindset/Thinking critically/Systems thinking/Problem solving skills** Ability to adapt products to rapidly shifting consumer tastes and trends. Ability to determine the deeper meaning or significance of what is being expressed via technology. Ability to understand how things that are regarded as systems influence one another within a complete entity, or larger system. Ability to think holistically.
3	**Language, Literacy and Numeracy (LLN) skills** Foundation skills of literacy and numeracy.
4	**Technology use and application skills** Ability to create and/or use of technical means understand their interrelation with life, society, and the environment. Ability to understand and apply scientific or industrial processes, inventions, methods etc. Ability to deal with increasing mechanisation and automation and computerisation. Ability to do work from mobile devices rather than from paper.

Rank	Generic Skill
5	**Communication/Collaboration, including Virtual collaboration/Social intelligence skills** Ability to understand and apply the principles of creating more value for customers with fewer resources (lean manufacturing) and collaborative skills. Ability to critically assess and develop content that uses new media forms and leverage these media for persuasive communications. Ability to connect with others deeply and directly, to sense and stimulate reactions and desired interactions.
6	**Managerial/Leadership skills** Ability to effectively communicate with all functional areas of the organisation. Ability to represent and develop tasks and work processes for desired outcomes. Ability to oversee processes, guide initiatives and steer employees toward achievement of goals.
7	**Data analysis skills** Ability to translate vast amounts of data into abstract concepts and understand data-based reasoning. Ability to use data effectively to improve programs, processes and business outcomes. Ability to work with large amounts of data: facts, figures, number crunching, analysing results.
8	**Science, Technology, Engineering and Maths (STEM) skills** Sciences, mathematics and scientific literacy.
9	**Environmental and Sustainability skills** Ability to focus on problem-solving and the development of applied solutions to environmental issues and resource pressures at local, national and international levels.
10	**Customer service/Marketing skills** Ability to interact with another human being, whether helping them find, choose or buy something. Ability to supply customers' wants and needs both via face-to-face interactions or digital technology. Ability to manage online sales and marketing. Ability to understand and manage digital products.
10	**Financial skills** Ability to understand and apply core financial literacy concepts and metrics, streamlining processes such as budgeting, forecasting, and reporting, and stepping up compliance. Ability to manage costs and resources, and drive efficiency.
12	**Entrepreneurial skills** Ability to take any idea, whether it be a product and service, and turn that concept into reality and not only bring it to market but make it a viable product and/or service. Ability to focus on the very next step to get closer to the ultimate goal. Ability to weather the ups and downs of any business. Ability to sell ideas, products or services to customers, investors or employees, etc.
13	**Other generic skills**

E. PROPOSED SCHEDULE OF WORK

Year	Project Title and Description
2018–2019	**Recycling and de-inking recovered paper** Review and develop new units of competency to support the recovered paper and cardboard processing, including pulp de-inking and bleaching processes for high- and medium-grade paper products. About three new units of competency will be developed at AQF levels 3 and 4 in pulping operations to address requirements regarding the current processes for recycling and de-inking recovered paper. *See Attachment A for further detail.*
2019–2020	**Bioenergy** Review and develop new units of competency to support conversion of residual waste from pulp and paper manufacturing operations into energy, which in turn helps to power paper mills.
2020–2021	**Leadership in pulp and paper** Review and develop new units of competency to support high-order skills in pulping and papermaking operations, including knowledge and critical thinking of pulping and papermaking processes and technologies; and leadership skills in sustainability, quality and safety.
2020–2021	**Paper product chain-of-custody and sustainability skills at all occupational levels** This project is subject to industry consultation achieved during the following AISC cross-sector projects, 'Supply Chain' and 'Environmental Sustainability', and these projects' outcomes. In principle, this project aims to cover the review and development of new units of competency to support responsible purchases of wood/pulp raw material and ensure environmental sustainability from the forest to the consumer, including all successive stages of processing, manufacturing, distribution and recycling of post-consumer waste into a product.
2020–2021	**Biorefining** Review and develop new units of competency to support operations in a pulp-mill-based biorefinery unit for biofuels, biochemicals and biomaterials. It will also address emerging skill needs for implementing nanotechnology in a range of papermaking processes and production stages, including wet-end papermaking, calendering and coating of paper and packaging materials.
2020–2021	**Automated processes in converted paper manufacturing** Review and develop new units of competency for operating current processes and technologies in paper bag, paper stationery and sanitary paper product manufacturing.

Time-critical projects

No time-critical projects were identified for *the PPM Pulp and Paper Manufacturing Training Package* in the Proposed Schedule of Work.

The criteria to outline time critical projects include workplace safety issues, regulatory needs, and qualifications under *VET Student Loans* courses list that can benefit from improvement or development of national skills standards.

Interdependencies

No training packages or IRCs' interdependencies were identified for the projects listed in the Proposed Schedule of Work.

F. CURRENT AND COMPLETED PROJECTS

Current projects

The industry is currently undertaking the following project that emerged from the *2017 Skills Forecast and Proposed Schedule of Work*:

- Pulp and Paper Manufacturing Safety Compliance Project.

The project is expected to be completed by June 2018. Refer to *Attachment B – Current IRC Projects* for the list of units, which are currently under development and review.

Completed projects

No project was commissioned previously from the *2016 Skills Forecast and Proposed Schedule of Work*.

G. IRC SIGNOFF

This IRC Skills Forecast and Proposed Schedule of Work was agreed as the result of a properly constituted IRC decision.

Signed for and on behalf of the **Pulp and Paper Manufacturing IRC** by its appointed Chair:

Denise Campbell Burns

(Name of Chair)

Signature of Chair

Date: 29 April 2018

ATTACHMENT A

2018–2019 Project Details

Relevant training package: PPM Pulp and Paper Manufacturing

Contact details: Skills Impact Ltd, 559A Queensberry Street, North Melbourne VIC 3051

Date submitted to Department of Education and Training: 28 April 2018

Project Title

Recycling and de-inking recovered paper

Description

This project will review and develop new units of competencies to support the recovered paper and cardboard processing, including pulp de-inking and bleaching for high- and medium-grade paper products.

The project will develop about three new units of competency at AQF levels 3 and 4 in pulping operations to address requirements regarding the current recycling and de-inking recover paper processes.

Rationale

Australia's recovery and recycling of paper and paperboard has increased dramatically over the last 10–15 years. In 2016, the recycling rate for all paper and paperboard was 73.7%. This equals about 3.077 million tonnes of recovered paper and paperboard, with more than half being re-processed for local utilisation.[26] The remaining part is exported to North and South-East Asia areas, which are fibre-deficient.

Consumer awareness of environmental issues, together with a growing demand for Australian-made recycled office, printing, envelope and stationery paper, and expansion of the containerboard market, have provided local paper and cardboard companies with the opportunity to invest in recycling operations.

The use of recycled fibre in paper manufacturing also consumes less energy, water and chemical agents (e.g. bleach) compared to virgin fibre, as it requires less raw material and energy to pulp recycled paper products than virgin wood chips.

The majority of recovered paper and cardboard is re-processed by large manufacturers, including Visy, Amcor, Australia Paper and Norske Skog in New South Wales, Victoria and Queensland.

Most recovered papers are used to produce brown-grade papers and boards. However, there has been a substantial increase in the use of recovered papers to produce, through de-inking, white-grade papers, such as newsprint, tissue and market pulp. Visy and Amcor process both high-, medium- and low-grade waste paper into a wide range of recycled paper products. Australian Paper's new de-inking and recycling plant in Latrobe Valley (Victoria) processes high-grade (office)

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[26] AFPA, 2016 National Pulp & Paper Sustainability Report. [www] http://ausfpa.com.au/wp-content/uploads/2017/09/AFPA-Sust-Report_vF.pdf.

waste paper into recycled copy paper, envelope and printing paper. Norske Skog converts waste catalogues and newsprint into recycled newsprint.

The recovered paper and cardboard re-processing involves production of recycled pulp from recovered papers (waste paper sorting, re-pulping, cleaning and screening), de-inking and bleaching (if the pulp is used to manufacture white paper, newsprint, tissue and market pulp), and manufacturing a paper by using this pulp alone or mixed with other pulps, which can be virgin or recycled. The former step is not very different from the production of paper from virgin pulp.

The IRC proposes development of new units to address the current skill needs for the production of recycled pulp from recovered papers. Specific skills gaps and competency requirements are identified in the following critical areas:

- Sorting recovered paper, including ability to operate technology and processes to handle, identify and separate paper grades for recycling.

- Recovered paper pulping and contaminant removal including knowledge of techniques to produce pulp slurry and remove contaminates such as clay, metals and glue. Knowledge of contaminants in different paper grades and impacts on product quality, recycling infrastructure, and workplace health and safety.

- De-inking recycled pulp, including knowledge of treatments to remove the ink and their function. The first step is performed during pulping (slushing) and involves ink detachment from the surface of the disintegrated fibres. In the second step, the detached ink particles are removed from the pulp slurry by washing or flotation.

- Bleaching of recycled pulp, including knowledge of the processes and chemicals used for bleaching de-inked pulp.

It is estimated that at least three new units will need to be developed to provide for skills gaps regarding the fundamental knowledge of recovered fibre recycling for papermaking and operation of a pulping and de-inking process for recovered paper.

Addressing the Minister's Priorities

Priority: Obsolete qualifications removed from the system.

Preliminary analysis conducted for this project has not identified obsolete training package components that could potentially be removed from the system.

Priority: More information about industry's expectations of training delivery is available to training providers to improve their delivery and to consumers to enable more informed choices.

As part of the project, the Pulp and Paper Manufacturing IRC will also seek to identify industry's expectations of training delivery. Information will be presented in the *PPM Training Package* Companion Volume and Implementation Guide for training providers to improve their delivery.

Priority: The training system better supports individuals to move more easily between related occupations.

Preliminary analysis indicates that the new training package components proposed for development may not be suitable for use in other industry sectors. They are highly specialised for the pulp and paper operations industry.

Priority: Improved efficiency of the training system through units that can be owned and used by multiple industry sectors.

As above.

Priority: Foster greater recognition of skill sets.

The industry has a growing interest in flexible training options, including the provision of specific skill sets rather than completion of a full qualification. The industry is likely to advise on the development and use of new skill sets.

Consultation Plan

The Pulp and Paper Manufacturing IRC has proposed and agreed on the following project consultation plan.

- Technical Advisory Committees (TAC) will be established for providing technical expertise and guidance to the sub-projects during the development stage. Subject matter experts and companies proposed to be part of TAC are provided in the list below.

- Project updates on the Skills Impact's project web page, news alerts and industry newsletters.

- Two sessions of broad industry consultation on the draft and final draft units and skill sets via online surveys.

- Project updates and input sessions during relevant industry events.

Proposed composition of the Technical Advisory Committee:

Organisation	State/Region
Visy	VIC
Amcor	VIC/NSW
Australian Paper	VIC
Norske Skog	TAS

Scope of the Project

The project is expected to start in 2018–2019 and be completed within 12 months from its approval. Based on previous experience, the project should allow sufficient time for engaging industry stakeholders with the project. This process is often lengthy and laborious, and the project outcomes depend on industry participation.

About three new units of competency will be developed:

PPMHWPXXX Understand recycling and de-inking recovered paper for papermaking **(New)**

PPMHWPXXX Handle, identify and separate paper grades for recycling **(New)**

PPMHWPXXX Operate a pulping and de-inking process for recovered paper **(New)**

ATTACHMENT B

Current IRC projects for the pulp and paper manufacturing industry

Relevant training package: PPM Pulp and Paper Manufacturing

Contact details: Skills Impact Ltd, 559A Queensberry Street, North Melbourne VIC 3051

Date submitted to Department of Education and Training: 28 April, 2018

Year	Project	Qualification Code and Title	Unit of Competency Code and Title
2017–2018	Pulp and Paper Manufacturing Safety Compliance		Current units to be reviewed and updated: **Chemical recovery operations** PPMREC210 Monitor and control chemical recovery operations PPMREC320 Prepare and start up chemical recovery operations PPMREC330 Coordinate and implement chemical recovery shutdowns PPMREC440 Troubleshoot and rectify chemical recovery operations **Coated paper processes** PPMCPP210 Monitor and control coated paper processes PPMCPP320 Prepare and start up coated paper processes PPMCPP330 Coordinate the shutdown of coated paper processes PPMCPP440 Troubleshoot and rectify coated paper processes **Dry-end operations** PPMDEO210 Monitor and control dry-end operations PPMDEO320 Prepare and start up dry-end operations PPMDEO330 Coordinate and implement dry-end shutdown PPMDEO440 Troubleshoot and rectify dry-end systems **Finishing and converting** PPMFCO210 Monitor, control and shut down finishing and converting operations PPMFCO320 Prepare and start up finishing and converting operations PPMFCO340 Troubleshoot and rectify finishing and converting systems **Electrical power generation**

Year	Project	Qualification Code and Title	Unit of Competency Code and Title
			PPMEPG210 Monitor and control power generation system
			PPMEPG320 Manage a power generation system startup
			PPMEPG330 Coordinate power generation system shutdown
			PPMEPG440 Troubleshoot and rectify power generation system
			Pulping operations
			PPMPUL210 Monitor and control pulping operations
			PPMPUL320 Prepare and start up pulping system operations
			PPMPUL330 Coordinate and implement pulping plant shutdowns
			PPMPUL440 Troubleshoot and rectify pulping processes
			Stock preparations operations
			PPMSPR210 Monitor and control stock preparation systems
			PPMSPR320 Prepare and start up stock preparation system for production
			PPMSPR330 Coordinate and implement stock preparation system shutdown
			PPMSPR440 Troubleshoot and rectify stock preparation systems
			Steam generation
			PPMSTM210 Monitor and control boiler operation
			PPMSTM320 Manage steam boiler startup
			PPMSTM330 Shut down and bank steam boiler
			PPMSTM440 Troubleshoot and rectify boiler plant systems
			Waste paper operations
			PPMWPO210 Monitor and control waste paper operations
			PPMWPO320 Prepare and start up waste paper operations
			PPMWPO330 Coordinate and implement waste paper shutdown
			PPMWPO440 Troubleshoot and rectify waste paper operations
			Water services
			PPMWAS210 Operate water systems
			PPMPUL330 Coordinate and implement pulping plant shutdowns
			PPMWAS340 Troubleshoot and rectify water systems
			Wet-end operations
			PPMWEO210 Monitor and control wet-end operations

Year	Project	Qualification Code and Title	Unit of Competency Code and Title
			PPMWEO320 Prepare and start up wet-end operations
			PPMWEO330 Coordinate and implement wet-end shutdown