



**Ash Development
Association of Australia**

Ash Development Association of Australia

Annual Production and Utilisation Survey Report

January - December 2018

Prepared by
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Membership Survey Results: 2018

Summary

The beneficial use of coal combustion products (CCPs) during 2018 resulted in 5.936 million tonnes or 47% being beneficially used, resulting in the conservation of; energy; finite natural resources, the reduction of carbon emissions through the recovery of CCPs being mineral by-product resources.

The survey results for CCP production and end uses for the period January to December 2018 discussed in this report are shown in Table 1. Over the survey period more than 90 million tonnes of thermal coal was consumed to generate vital energy to support the Australian economy. Some 12.6 million tonnes of all CCPs were produced with 47% being effectively utilised¹ within various civil and construction applications throughout Australia.

Total CCPs produced increased slightly over the reporting period, but the longer term trend has been decreasing. This decline is consistent with reduced demand for thermal coal as an energy source, coupled with ongoing energy reforms, renewable energy targets (RET) and state government privatisation agenda for electricity over the past several years.

Methodology

Annual members and non-members are surveyed for CCPs generated, stored and sold during the reporting period January to December 2018. Information provided by members² and non-members³ is collated, compared with other data sources for verification purposes and then aggregated into national data set. The import and export of CCPs were included, however sources and destinations are not identified.

Discussion of results

Total CCPs generation for the period increased slightly from 12.2 (2017) million tonnes to 12.6 (2018) million tonnes. Equally CCPs used also increased over the period from 5.05 million tonnes (2017) to 5.936 million tonnes during 2018. This increased use is largely from large scale projects offering some beneficial use (e.g. on-site mine remediation, local haul roads etc.) and partly from continued demand within the supply chains for construction materials (e.g. cement and concrete manufacture).

High value utilisation end uses in Category 1 continue to be attributable to 'graded' (See AS 3582.1 and AS 2758) materials used in cement and concrete manufacture. The largest increase occurred in structural/civil, mining and mine site remediation in Category 2 and 3. 'Harvesting' of CCPs has increased internationally, particularly within well established markets such as the USA where access to CCPs has become restricted due to the station closures.

Ongoing regulatory reform advocated by the Ash Development Association of Australia continues its focus on new end use market opportunities for 'ungraded' material

¹ "Effective utilisation" is the sale or utilisation of recoverable mineral resources into a value added construction application that provides both commercial returns [revenue] return on investment or an economic profit [avoided expense], and use is consistent with the criteria of ecologically sustainable development (EDS) principles.

² <http://www.adaa.asn.au/membership.htm>.

³ Power stations.

applications, when coupled with changes to AS3582.1 and AS 2758, these end-use applications are expected to grow. The use of CCPs, in particular fly ash has been proven to significantly contribute to further reducing the carbon footprint of the cement and concrete sector⁴, however additional processing capacity to produce 'graded' fly ash to meet growing demand, coupled with supply chain inventory capacity are essential. Further research needs to be undertaken to exploit (harvest) the large volumes of 'homogenously' stored materials within ash dams to buffer natural material supply chain demands.

Demand for fine and coarse aggregate use in structural/civil applications is closely tied to consumption or growth in the future development of infrastructure in both urban and regional Australia – estimated to be in excess of 160 million tonnes annually. Extractive resources are generally widespread and remain in adequate supply nationally, however, shortages in important large-scale markets (Sydney, Melbourne and Brisbane) have emerged, requiring additional logistics and associated handling costs not historically incurred. These are mainly attributed to unsuitable geology, conflicting or incompatible land uses and environmental problems caused by high rates of urban expansion. Natural sand and gravel resources are also being depleted leading to opportunities for substitution by ungraded CCPs.

There has been a considerable increase in interest from extractive industries to supplement natural sand and gravel resources with recovered resources such as CCPs, which is an area of considerable focus.

⁴ Heidrich, C., I. Hinczak, et al. (2005). Case study: CCP's potential to lower Greenhouse Gas emissions for Australia. World of Coal Ash 2005, Lexington, Kentucky, USA, American Coal Ash Association & University of Kentucky.

Key results of survey

The survey results include all generators⁵, marketers⁶ and users for the total production and resulting sales by each end use. Where required, data was supplemented with importation data and other secondary data⁷ sources for accuracy purposes.

- Approximately 12.6 Mt (million tonnes) of CCPs were produced within Australasia. On a per capita basis, this equates to approx 502 kg/person. (12.6Mt/25.09M population)
- Some 5.936 Mt or 44% of CCPs produced have been effectively utilised in various value-added products or to some beneficial end over the period. On a per capita basis, this equates to approx 236 kg/person recycled or reused. (5.936Mt/25.09M population)
- Approximately 1.983 Mt or 33% of fine grade fly ash was used beneficially in high value-added applications such as cementitious binders, concrete manufacture or mineral fillers.
- About 0.42 Mt or 7% of CCPS was used in non-cementitious applications such as flowable fills, structural fills, road bases, coarse/fine aggregates.
- Some 3.56 Mt was used in projects offering some beneficial use (e.g. on site remediation, local haul roads etc.). These uses typically generate no economic return, that is, cost avoidance or recovery only.
- Some 6.65 Mt were placed into onsite storage ponds awaiting some future use opportunity where material would be harvested for economic use.
- More than 52 Mt of CCPs [fly ash] have been used in cementitious applications or concrete manufacture from 1975 to 2018 [43 years].
- 52 Mt of CCPs divided into 1 tonne bulker bags (84cm x84cm x 84cm) placed side by side would circle the earth's circumference once.

In summary, the use and recovery of CCPs provide positive and significant environmental impacts, including resource conservation, the reduction of greenhouse gas emissions through the conservation of energy and processing emission from conservation of virgin resources through displacement or substitution by CCPs.

The following table provides more detail for individual category sales of CCPs for the 2018 calendar year.

Ash Development Association of Australia Inc
July 2019

⁵ Generator – means a company who generates coal powered electricity, produces CCPs as a by-product and has been admitted as a member. CCPs can be supplied to processors, consumers or value adders.

⁶ Marketers (Value adder) – means a company who processes, mixes, blends, or otherwise incorporates CCPs to produce products for supply to consumers or other value adders.

[A value adder typically incorporates owned intellectual property].

⁷ Company annual reports and other published data sources.

Ash Development Association of Australia

2018 Membership Survey - CCP Production & Use Survey

SECTION A. Fuel or Coal Used	Tonnes Consumed	Avg % Ash Content	Ash (Auto-Calc)	Ash (Manual-Calc)					
A1: Bituminous (Black Coal)	49,535,847	23%	11,316,629						
A2: Sub-bituminous	4,531,568	8%	362,525						
A3: Lignite (Brown Coal)	36,910,634	2%	878,867						
Total Coal Burned (Auto-calc)	90,978,049	14%	12,558,022						
SECTION B. CCPs Beneficial Use Calculations (Tonnes)	Fly Ash	Furnace Bottom Ash	Cenospheres	Combined 2018	Combined 2017	Combined 2016	Combined 2015	Combined 2014	
B1. Total Produced (Jan-Dec)	11,189,116	1,340,107	65,605	12,594,827	12,210,944	12,347,461	12,418,366	12,384,140	
B2. Total not used [Stored]	5,937,899	702,365	17,930	6,658,193	7,160,328	7,319,971	7,721,624	7,470,084	
Total of All Used (Auto-Calc)*	5,251,217	637,742	47,675	5,936,634	5,050,616	5,027,491	4,696,742	4,914,056	
					47%	41%	41%	38%	40%
SECTION C. CCP Use (Tonnes)	Fly Ash	Furnace Bottom Ash	Cenospheres	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	
C1. Cement/Concrete Products /Grout	1,705,863	180,072	6,025	1,920,113	1,736,068	1,795,365	1,589,976	1,738,590	
C1. Cement/ Raw Feed for Clinker	-	21,872	-	21,872	107,247	-	10,000	10,000	
C1. Mineral Fillers	-	-	41,650	41,650	17,845	20,000	23,023	70,000	
Category 1	1,705,863	201,944	47,675	1,983,635	1,861,160	1,815,365	1,622,999	1,818,590	
					33%	37%	36%	35%	37%
C2. Flowable Fill CLSM	4,409	-	-	4,409	92,427	71,337	80,000	9,000	
C2. Structural Fills/Embankments	-	20,000	-	20,000	20,000	69,847	39,000	129,108	
C2. Road Base/Sub-base	50,000	243,012	-	293,012	180,000	201,868	189,718	188,718	
C2. Soil Modification/Stabilization	-	-	-	-	-	11,305	0	0	
C2. Mineral Filler in Asphalt	-	-	-	-	-	-	21,000	20,000	
C2. Agriculture	-	918	-	918	17,676	1,117	4,117	76,117	
C2. Aggregate	-	98,000	-	98,000	116,423	123,505	156,000	224,000	
Category 2	54,409	361,930	-	416,339	426,526	478,979	489,835	646,943	
					7%	8%	10%	10%	13%
C3. Mining Applications (e.g. Backfill)	3,459,354	71,306	-	3,530,660	2,683,930	2,606,147	2,456,908	2,341,023	
C3. Waste Stabilization/Solidification	23,288	2,562	-	25,850	78,000	126,000	126,000	106,000	
C3. Miscellaneous/Other	8,303	-	-	8,303	1,000	1,000	1,000	1,500	
Category 3	3,490,945	73,868	-	3,564,813	2,762,930	2,733,147	2,583,908	2,448,523	
					60%	55%	54%	55%	50%
Total Use (C1, C2, C3)*(Auto-calc)	5,251,217	637,742	47,675	5,964,787	5,050,616	5,027,491	4,696,742	4,914,056	
SECTION D. Summary Results	Fly Ash	Furnace Bottom Ash	Cenospheres	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	
7. Total of All Beneficially Used (Auto-Calc)*	5,251,217	637,742	47,675	5,936,634	5,050,616	5,027,491	4,696,742	4,914,056	

Table 1 - 2018 CCP Sales and Production Survey⁸

⁸ Data presented in this table is aggregated based on member and non-member responses. Where appropriate, estimates are given based on published public reports. Coverage of data represents all coal fired power stations currently operating.