



**Ash Development
Association of Australia**

Ash Development Association of Australia

Annual Membership Survey Results

January - December 2017

Prepared by
HBM Group Pty Ltd

ADAA National Office Unit 5, 41 - 47 Five Islands Road, Port Kembla NSW 2505
T. 02 4228 1389 • F. 02 4258 0169 • W. www.adaa.asn.au • E. info@adaa.asn.au

Postal Address PO Box 85, Port Kembla NSW 2505

Membership Survey Results: 2017

Summary

The beneficial use of coal combustion products (CCPs) during 2017 resulted in 6.78 million tonnes or 56% being beneficially used through the conservation of energy, finite natural resources, the reduction of carbon emissions and the recovery of mineral by-product resources were all major benefits identified in this report.

The survey results for CCP production and end uses for the period January to December 2017 discussed in this report are shown in Table 1. From the more than 80 million tonnes of thermal coal consumed to produce vital energy, some 12.1 million tonnes of all CCPs were produced with 56% being effectively utilised¹ within various civil and construction applications throughout Australia.

Total CCPs produced reduced slightly over the reporting period. This decline is consistent with reduced demand for coal as an energy source and ongoing energy reforms, renewable energy target and state government privatisation agenda over the past several years.

Methodology

Annual members and non-members were surveyed for CCPs generated, stored and sold during the reported period, which provides results for the calendar year, January to December 2017. Information provided by members² and non-members³ was 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 decreased slightly from 12.4 (2016) million tonnes to 12.1 (2017) million tonnes. The 6.78 million tonnes utilised during 2017 is largely from large scale projects offering some beneficial use (e.g. on site 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 continue to be attributable to 'graded' (See AS 3582.1 and AS 2758) materials used in cement and concrete manufacture, structural/civil applications and mining applications such as mine site remediation, with continued growth in Category 2 and 3 sales for 'ungraded' materials. Interestingly, the 'Harvesting' of CCPs have become an international growing trend in well established markets such as the USA.

Ongoing regulatory reform advocated by the ADAA continues to focus on new end use market opportunities for 'ungraded' material applications, when coupled with changes to AS3582.1 and AS 2758, these end-use applications are expected to grow. The use of CCPs,

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.

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 the large volumes of 'homogenously' stored materials within ash dams to buffer 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) are emerging, 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 within the Association with the Cooperative Research Centre for Low Carbon Living research projects.

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 12.1 Mt (million tonnes) of CCPs were produced within Australasia. On a per capita basis, this equates to approx 500 kg/person. (12.1Mt/24.13M population)
- Some 6.78 Mt or 56% 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 280 kg/person recycled or reused.
- Approximately 1.86 Mt of fine grade fly ash was used beneficially in high value-added applications such as cementitious binders, concrete manufacture or mineral fillers.
- About 0.7 Mt or 18% of CCPs was used in non-cementitious applications such as flowable fills, structural fills, road bases, coarse/fine aggregates and mine site remediation.
- Some 4.2 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 5.32 Mt were placed into onsite storage ponds awaiting some future use opportunity where material would be harvested for economic use.
- More than 50 Mt of CCPs [fly ash] have been used in cementitious applications or concrete manufacture from 1975 to 2017 [42 years].
- 50 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 2017 calendar year.

Ash Development Association of Australia Inc
July 2018

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

2017 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)	46,139,306	24%	10,937,239														
A2: Sub-bituminous	4,804,021	8%	378,374														
A3: Lignite (Brown Coal)	36,910,634	2%	878,867														
Total Coal Burned (Auto-calc)	87,853,961	14%	12,194,481														
SECTION B. CCPs Beneficial Use Calculations (Tonnes)	Fly Ash	Furnace Bottom Ash	Cenospheres	Combined 2017	Combined 2016	Combined 2015	Combined 2014	Combined 2013	Combined 2012	Combined 2011	Combined 2010	Combined 2009	Combined 2008				
B1. Total Produced (Jan-Dec)	10,806,252	1,343,877	60,815	12,210,944	12,347,461	12,418,366	12,384,140	12,264,395	12,797,331	13,680,219	14,076,233	13,755,682	14,638,323				
B2. Total not used (Stored)	7,266,229	610,796	31,979	7,909,004	9,363,714	9,601,852	8,637,847	8,276,419	9,755,479	10,365,700	10,365,700	9,053,178	12,246,852				
Total Production Used (Auto-Calc)	3,540,023	733,081	28,836	4,301,940	2,983,748	2,816,514	3,746,293	3,987,975	3,041,852	4,258,953	3,710,533	4,702,504	2,391,471				
B3. Amounts removed or diverted from storage	2,455,736	10,092	18,604	2,484,431	2,372,340	2,322,908	2,187,408	2,365,284	2,343,291	2,368,626	2,101,983	2,037,200	2,192,625				
Total of All Used (Auto-Calc)*	5,995,759	743,173	47,440	6,786,372	5,356,087	5,139,422	5,933,701	6,353,259	5,385,143	6,627,579	5,812,516	4,702,504	4,584,096				
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)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)				
C1. Cement/Concrete Products /Grout	1,444,403	271,301	20,365	1,736,068	1,795,365	1,589,976	1,738,590	1,647,317	1,893,613	2,029,563	1,889,991	1,571,495	1,757,379				
C1. Cement/ Raw Feed for Clinker	7,240	100,007	-	107,247	-	10,000	10,000	10,000	0	61,174	0	0	0				
C1. Mineral Fillers	-	-	17,845	17,845	20,000	23,023	70,000	25,000	10,000	35,879	0	0	30,000				
Category 1	1,451,643	371,307	38,210	1,861,160	1,815,365	1,622,999	1,818,590	1,682,317	1,903,613	2,126,616	1,889,991	1,571,495	1,787,379				
C2. Flowable Fill CLSM	7,240	85,187	-	92,427	71,337	80,000	9,000	0	0	180,715	35,000	22,180	215,000				
C2. Structural Fills/Embankments	-	20,000	-	20,000	69,847	39,000	129,108	135,813	123,108	95,515	103,505	12,820	227,821				
C2. Road Base/Sub-base	50,000	130,000	-	180,000	201,868	189,718	188,718	229,615	115,300	295,899	320,334	476,360	0				
C2. Soil Modification/Stabilization	-	-	-	-	11,305	0	0	31,000	41,000	0	11,725	10,936	30,000				
C2. Mineral Filler in Asphalt	-	-	-	-	-	21,000	20,000	0	0	0	8,787	8,787	7,209				
C2. Agriculture	-	17,676	-	17,676	1,117	4,117	76,117	1,259	600	600	0	0	0				
C2. Aggregate	-	116,423	-	116,423	123,505	156,000	224,000	181,000	123,000	20,000	5,708	708	0				
Category 2	57,240	369,286	-	426,526	478,979	489,835	646,943	578,687	403,008	592,729	485,059	531,791	489,030				
C3. Mining Applications (e.g. Backfill)	164,000	35,499	-	199,499	233,807	134,000	153,615	166,979	81,000	166,775	83,000	107,500	275				
C3. Waste Stabilization/Solidification	78,000	-	-	78,000	126,000	126,000	106,000	106,500	34,500	15,913	6,446	6,443	8,991				
C3. Miscellaneous/Other	1,000	-	-	1,000	1,000	1,000	1,500	1,500	2,000	0	1,500	0	0				
Category 3	243,000	35,499	-	278,499	380,807	261,000	261,115	274,979	117,500	182,688	90,946	113,943	9,286				
Total Use (C1, C2, C3)(Auto-calc)	1,751,883	776,092	38,210	2,566,185	2,655,151	2,373,834	2,726,648	2,535,983	2,424,121	2,992,033	2,465,996	2,217,229	2,276,675				
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)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)	Combined (Auto-Calc)				
7. Total of All Sold (Auto-Calc)*	1,751,883	776,092	38,210	2,566,185	2,783,331	2,373,834	2,726,648	2,535,983	2,424,121	2,184,018	2,184,018	2,217,229	2,276,675				
6. Total of All Beneficially Used (Auto-Calc)*	5,995,759	743,173	47,440	6,786,372	5,356,087	5,139,422	5,933,701	6,353,259	5,385,143	6,627,579	5,812,516	4,254,429	4,469,300				

Table 1 - 2017 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.