



**Ash Development
Association of Australia**

Ash Development Association of Australia

Annual Membership Survey Results

January - December 2016

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Membership Survey Results: 2016

The beneficial use of coal combustion products (CCPs) during 2016 resulted in 5.35 million tonnes or 43% being effectively utilised. The conservation of energy, finite natural resources, the reduction of carbon emissions and the effective recovery of mineral by-product resources that would otherwise be placed into long term storage were all major benefits.

The survey results for CCP production and categorised end uses for the period January to December 2016 are shown in Table 1.

From the 12.3 million tonnes of all CCPs produced 43% of were effectively utilised¹ within various civil and construction applications throughout Australia. CCPs production has remained stable over the past 4 years, reversing the overall decline in the use of coal as a major energy source arising from wide ranging environmental reforms, renewable energy target and state government privatisation agenda over the past several years. CCP utilisation over the periods of 2010, 2011, 2012, 2013 2014 and 2015 have grown slightly with effective utilisation being 41%, 48%, 42%, 52%, 48% and 48% respectively.

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 2016. 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 CCP generation for the period has increased slightly from 12.1 (2015) million tonnes to 12.3 (2016) million tonnes. Some contributing factors are related to; the importation of CCPs from China and India, coupled with uplift in based-load demand at site where CCPs can be captured, processed and removed for beneficiation.

The 5.35 million tonnes utilised during 2016 is partly a function of the continued demand within the supply chains for cement and concrete. The principle utilisation end uses continue to be attributable to 'graded' (See AS 3582.1 and AS 2758) materials used in cement and concrete, structural/civil applications and mining applications such as mine site remediation, with growth in Category 2 and 3 sales for 'ungraded' materials.

Ongoing regulatory reform advocated by the Association focuses on new end use market opportunities for 'ungraded' material applications. Coupled with changes to AS3582.1 and AS 2758, these end use applications in 2017.

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.

The use of CCPs such as fly ash has been proven to significantly contribute to further reducing the carbon footprint of the cement and concrete sector⁴, but only where additional processing capacity can meet demand, coupled with supply chain inventory capacity and exploitation of large volumes of stored materials within ash dams to buffer the supply chain.

Demand for fine and coarse aggregate use in structural/civil applications continues to be 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 costs. 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.

Key results

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 12.3 Mt (million tonnes) of CCPs were produced within Australasia. On a per capita basis, this equates to approx 501 kg/person. (12.1Mt/24.13M population)
- Some 5.35 Mt or 43% 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 221 kg/person recycled or reused.
- Approximately 1.8 Mt or 68% of effectively utilised coal ash was used in high value-added applications such as cementitious binders, concrete manufacture or mineral fillers.
- About 0.48 Mt or 18% of effectively utilised coal ash was used in non-cementitious applications such as flowable fills, structural fills, road bases, coarse/fine aggregates and mine site remediation.
- Some 2.3 Mt or 19% 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.
- Surplus CCPs of 9.4 Mt are typically placed into onsite storage ponds awaiting some future opportunity for economic reuse.
- More than 47 Mt of CCPs [fly ash] have been used in cementitious applications or concrete manufacture from 1975 to 2016 [40 years].
- If all 47 Mt of CCPs was placed into 1 tonne bulker bags (84cm x84cm x 84cm) and placed in a straight line, the bags would circle the earth's circumference once.

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.

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.

In summary, the recovery and reuse of CCPs provide positive and significant environmental impacts, including resource conservation and in this case, the reduction of Greenhouse Gas emissions from the processing of virgin resources, resulting in the reduction of greenhouse gases.

The following table provides more detail for individual category sales of CCPs for the 2016 calendar year.

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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

2016 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)					46,704,637	24%	11,340,328											
A2: Sub-bituminous					12,310,444	18%	2,189,936											
A3: Lignite (Brown Coal)					53,413,116	2%	1,071,413											
Total Coal Burned (Auto-calc)					112,428,197	13%	14,601,677											
SECTION B. CCPs Beneficial Use Calculations (Tonnes)					Fly Ash	Furnace Bottom Ash	Cenospheres	Combined 2016	Combined 2015	Combined 2014	Combined 2013	Combined 2012	Combined 2011	Combined 2010	Combined 2009	Combined 2008		
B1. Total Produced (Jan-Dec)					10,960,982	1,335,998	50,481	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]					8,472,478	882,177	9,058	9,363,714	9,601,852	8,637,847	8,276,419	9,755,479	9,421,266	10,365,700	9,053,178	12,246,852		
Total Production Used (Auto-Calc)					2,488,504	453,820	41,424	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					2,371,976	154	210	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)*					4,860,479	453,975	41,634	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)		
C1. Cement/Concrete Products /Grout					1,764,926	136,437	22,182	1,795,365	1,589,976	1,738,590	1,647,317	1,893,613	2,029,563	1,889,991	1,571,495	1,767,379		
C1. Cement/ Raw Feed for Clinker					-	-	-	-	10,000	10,000	10,000	0	61,174	0	0			
C1. Mineral Fillers					-	-	20,000	20,000	23,023	70,000	25,000	10,000	35,879	0	30,000			
Category 1					1,764,926	136,437	42,182	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					-	71,337	-	71,337	80,000	9,000	0	0	180,715	35,000	22,180	215,000		
C2. Structural Fills/Embankments					-	69,847	-	69,847	39,000	129,108	135,813	123,108	95,515	103,505	12,820	227,821		
C2. Road Base/Sub-base					59,718	142,150	-	201,868	189,718	188,718	229,615	115,300	295,699	320,334	476,360	0		
C2. Soil Modification/Stabilization					-	11,305	-	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	7,209			
C2. Agriculture					-	1,117	-	1,117	4,117	76,117	1,259	600	600	0	0	0		
C2. Aggregate					-	123,505	-	123,505	156,000	224,000	181,000	123,000	20,000	5,708	708	0		
Category 2					59,718	419,261	-	478,979	489,835	646,943	578,687	403,008	592,729	485,058	531,791	480,030		
C3. Mining Applications (e.g. Backfill)					134,000	99,807	-	233,807	134,000	153,615	166,979	81,000	166,775	83,000	107,500	275		
C3. Waste Stabilization/Solidification					126,000	-	-	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	1,500	2,000	0	0	1,500	0	0		
Category 3					261,000	99,807	-	360,807	261,000	261,115	274,979	117,500	182,688	90,946	113,943	9,266		
Total Use (C1, C2, C3)*(Auto-calc)					2,085,644	655,505	42,182	2,655,151	2,373,834	2,726,648	2,535,983	2,424,121	2,902,033	2,465,998	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)		
7. Total of All Sold (Auto-Calc)*					2,085,644	655,505	42,182	2,783,331	2,373,834	2,726,648	2,535,983	2,424,121	2,184,018	2,217,229	2,276,675			
6. Total of All Beneficially Used (Auto-Calc)*					4,860,479	453,975	41,634	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 - 2016 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.