



Ash Conveying Systems

Pneumatic Dense-Phase Ash Conveying Systems

Macawber

- 1 Multiple pick-up (feed) points on a single pipeline
- 1 Low profile equipment – excellent for retrofitting
- 1 Low power cost per ton transferred
- 1 Maintenance free equipment – no continuously moving parts
- 1 Very low material transfer velocity-schedule 40 pipeline
- 1 Worldwide experience since 1974
- 1 Worldwide technical support
- 1 ISO 9001

Macawber Engineering
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Low velocity fly ash handling

1. A well-proven method of transferring ash through standard pipelines at low velocity using small equipment that is virtually maintenance free. Continuous development since 1974 with concentrated specialisation ensures highest efficiency and operating reliability.
2. Experience in this specialised field is vital to success. Every ash type and combustion type has been handled by the Macawber dense-phase technology.
3. The Ashveyor® operating sequence is very simple and relaxed. The small cast iron vessels do not require a vent valve, a level probe or a discharge valve. Each cycle clears away deposited ash from the feed hopper leaving them normally empty.
4. Each line of Ashveyors® on each ESP field, economiser or bag house cycle simultaneously to transfer the ash through a common pipeline. Diverter valves for each feed point are not required and system controls are equally simple.
5. Typically, a major coal fired utility of 2 x 300 Mwat units using low quality coal with high ash content requires 46 tons/hour design rate over 350 metres from ESP units and handling high temperature ash at 350C from the economiser.



How does Macawber Technology Compare with Old Technology?

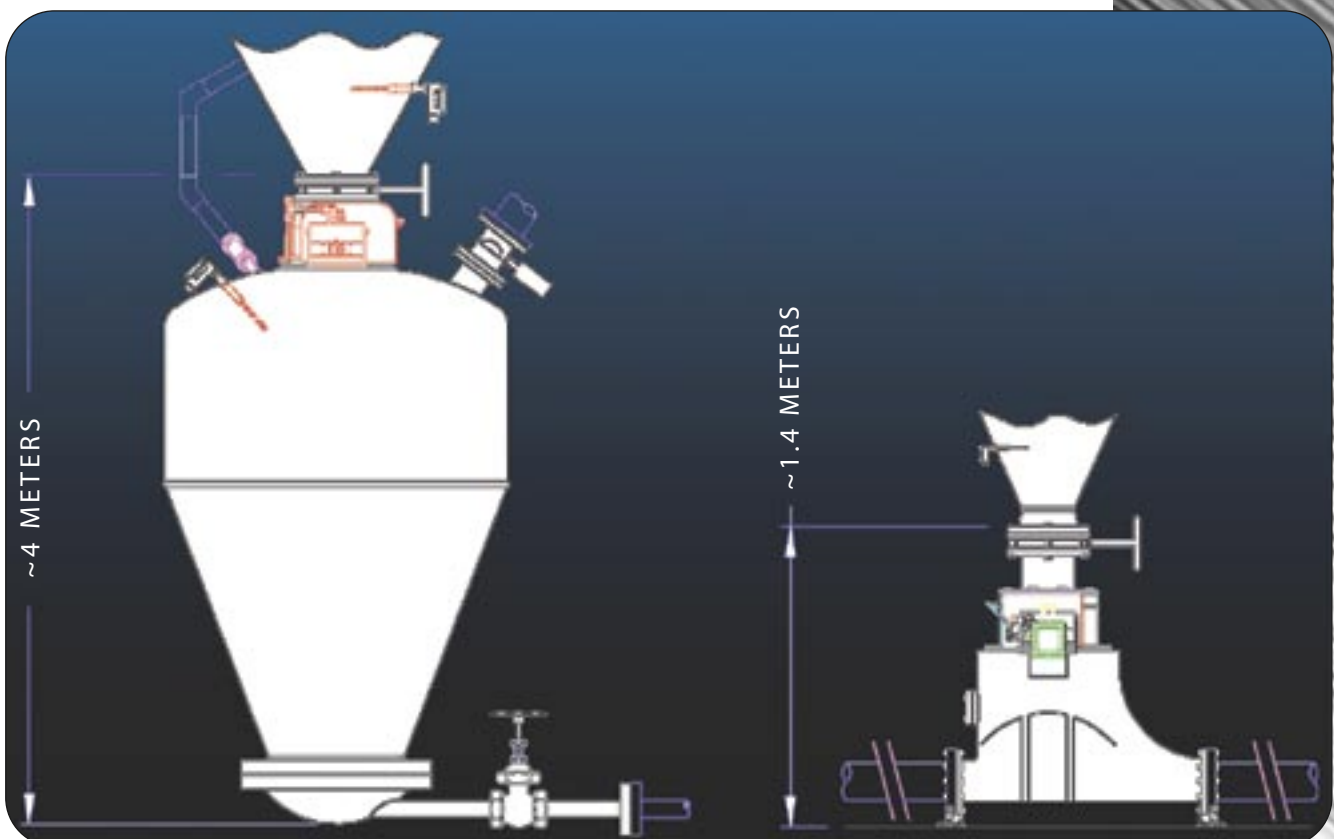
The following table compares Macawber's low-velocity, dense-phase Ashveyor® technology with the traditional (old) technologies of positive pressure, dilute-phase conveying and vacuum dilute-phase conveying. The example is for a typical conveying distance of 100 m (330 ft.).

Dimensions

Characteristic	Positive Pressure Dilute Phase	Vacuum Dilute Phase Dense	ASHVEYOR® Phase
Material-to-air Ratio	13	8	90
Average Material Velocity	18 m/s (60 f/s)	20 m/s (65 f/s)	4 m/s (13 f/s)
Energy Consumption kw per ton conveyed	110 kw	135 kw	75 kw
Pipewear	High	High	Low
ESP Hoppers Always Empty	No	No	Yes
Pipeline Material	Schedule 80 carbon steel or chrome cast iron	Chrome cast iron	Schedule 40 carbon steel

How does Macawber Compare with other Dense-phase Systems?

The typical old style dense-phase systems comprise large vessels with complex pipeline arrangements involving tee connections and discharge valves. The Macawber Ashveyor® system is compact, easy to install, and uses a single in-line pipeline arrangement that eliminates tee connections and discharge valves. In addition, the Ashveyor® system does not require level probes, vent valves or air inlet valves to each vessel. The following comparison is a scaled size view.





1. Dry Bottom Ash Handling

This is a proven development of the Ashveyor® working in conjunction with an ash crusher at each outlet. Crushed bottom ash is conveyed away through schedule 40 pipeline to storage.

2. From Wet to Dry

The elimination of water from bottom ash handling has many economic benefits. Additionally the problems of lagoon water quality control, space requirements and general maintenance requirements are avoided.

3. Operating Sequence

Each bottom ash outlet operates independently but conveys the ash through a common pipeline. The ash level inside the base of the boiler is signalled by a high temperature laser probe to release accumulated bottom ash through special cooling dump doors. The clinker enters the ash crusher to be reduced in size for the Ashveyor® to convey the particles to storage.

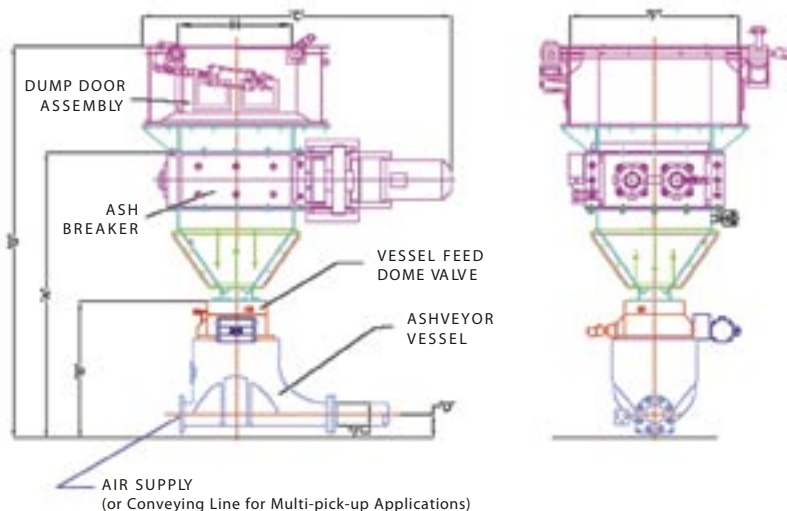
The accumulated clinker ash is cooled continuously by part of the total combustion air passing through the porous deck of the ash dump doors. Heat gain to this part of the combustion air assists boiler efficiency.

The ash crusher control incorporates an auto reversing drive automatically applied in the event of crusher overload due to foreign material entering the clinker crusher. This function is displayed at central control with visual and audio alarms.

The ash conveying sequence control arrangement includes a fault diagnostic facility. An audio alarm and visual display describes a fault condition, which may be easily remedied with operator friendly intervention at the system control facia.



MODEL	DIMENSIONS (INCH)								NET WT. LBS
	A	B	C	D	E	F	G	H	
42/B	68 3/8	32 1/2	58 1/4	6 1/8	4	19 3/4 x 19 3/4	93 1/4	11 3/4 x 11 3/4	2009
85/B	80	38	86 1/4	7 3/4	5	29 1/2 x 29 1/2	109	19 3/4 x 19 3/4	4420





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Specialised Applications

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In addition to ash conveying systems, Macawber has a range of equipment for special applications such as FBC bed drains, pressure let down systems, long distance conveying and ash re-injection.

Ash Re-injection System

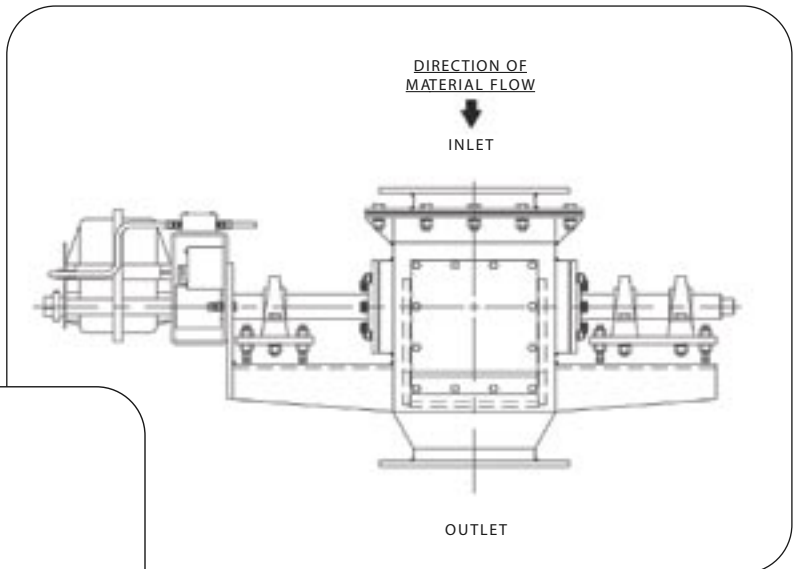
Macawber can provide a range of ash re-injection systems. The MiniDenseveyor® is ideal for returning carbon-rich ash back into the combustion process.

Long Distance Ash Conveying

Macawber provides a range of technologies for conveying ash over distances up to 2000 m (6500 ft). These technologies include the Denseveyor®, Variflow® and Macpump® dense-phase systems.

The Macpump® can convey at rates as high as 300 tph.

6



Fluid Bed Combuster Bed Drain Valves

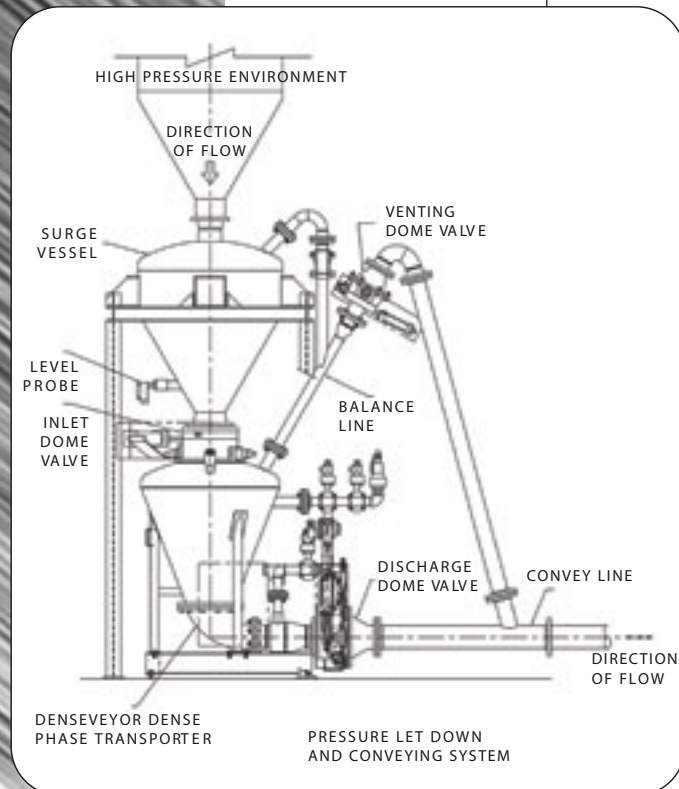
A high-temperature, dust tight clam shell type cut-off valve capable of up to 1500°F operation.

Pressure Let-down Systems

Many combustion systems such as gasifiers, circulating fluid bed combustors and combined cycle systems operate at high pressures – often as high as 600 psi.

Macawber Dome® Valve technology can provide means of transferring hot materials from high to low pressure environments.

Combined systems for pressure reduction and conveying are also available.



Application Examples

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Examples of the Ashveyor® ash handling process are well known throughout the world. They are used with all types of coal fired boiler and alternative fuels such as biomass, sewage sludge, garbage and medical waste.

1. Cottam Power Station UK. 4 x 500 Mwatt first fields ESP fly ash systems each comprising 9 x fly ash feed points on a single pipeline handling 28 tons/hour for 280 to 350 metres.

2. London Waste UK. 5 x 50 Mwatt ESP units handling domestic waste biomass fuel ash. Retrofit of dilute-phase ash handling system. handling 8 tons/hour for each system for 260 metres.

3. South Carolina Electric and Gas. USA. Retrofit of all ash handling and storage systems for 2 x 130 Mwatt boilers including bottom ash, fly ash, pyrites, back pass and air heater ash positions.

4. Liaoning Power Plant, China. Two new 300 Mwatt coal fired boilers for ESP fly ash and economiser fly ash. Design rate 46 tons/hour 360 metres.

5. Montenay Waste-to-Energy Plant, Panama City, Florida. USA. Handling lime-rich ash from garbage incineration with FGD treatment. Two streams, each stream conveying 2.5 tons/hour from Air Heater, FGD and Baghouse over 80m.

6. Shanghai Coke and Chemical Plant. China. High temperature ash from 8 gasifiers at 30 psig. Continuous pressure let down and dense-phase conveying at 350°C to storage. A total of 32 high temperature and high pressure let down/conveying systems.

7. Fibrothetford. UK. A comprehensive set of systems to handle ash from chicken litter biomass fuel. Bag house ash is heavily lime rich providing important variations to fly ash characteristics.

8. Koblitz Energy, Brazil. A waste to energy plant handling rice hulls fly ash. Four Ashveyors® transferring fly ash from a baghouse to a silo at 10 tons/hour over 250 metres.

9. City of Paulo Alto, USA. Sludge incineration plant handling sewage sludge ash at 18 tons/hour 180 metres in a 100mm pipeline with Ashveyors® conveying the ash to a storage silo and from there to a load out bin.

10. Alabama Power, Birmingham USA. Coal fired utility handling bottom ash and fly ash. Fifteen Model 1.5/8 Ashveyors® and seven with ash crushers. All ash is being transferred to a storage silo.

11. Agrilectric, Lake Charles, USA. Waste to energy plant handling rice hulls ash. Ten x 1.5/8 ashveyors® operating on a 100mm pipeline conveying fly ash from baghouses and mechanical collectors to a silo.

12. Mitsubishi, Japan. Fly Ash transfer through a 250mm pipeline over 250 metres at 30 tons/hour.

13. Fiddlers Ferry Power Station, UK. Fly Ash transfer through a 300mm pipeline over 170 metres at 120 tons/hour.



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A Macawber Group Company

ADVANCED PNEUMATIC CONVEYING SYSTEMS
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