

Section 1.0 – Plant Overview

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1.0 Plant Overview

This operation and maintenance manual is intended to provide the malt handling plant operator with a guide to the principles of operation and all manufactures data for commissioning and maintenance of equipment for the Malt Handling Plant supplied to South Australian Brewing, West End Brewery, Thebarton.

1.1 General Description

The function of the Malt Handling Plant upgrade installed at the West End Brewery is to provide storage and transfer of various malts/grains used within the brewing process.

Major equipment installed as part of the upgrade includes the following:

- 3 – off Pale Malt Storage silos, nominal capacity 150 tonnes (existing)
- 6 – off Speciality Malt silos, nominal capacity 50 tonnes
- 4 – off Imeco CSG100E Electronic Weighers
- 1 – off Imeco CSG50E Electronic Weigher
- 2 – off PDA Blowers 37kW, 1200m³/hr
- 1 – off PDA Blower 15kW, 720 m³/hr
- 2 – off Donaldson Dust Collector/Filters
- 1 – off WAMAir Polygonal Filter
- 1 – off WAMFlo Round Filter
- 2 – off Mitchells 300 Enmasse Conveyors
- 3 – off Mitchells 400 Screw Conveyors
- 9 – off Mitchells 250 Screw Conveyors
- 1 – off Mitchells 11624 Bucket Elevator
- Associated motor drives, piping, valves and instrumentation
- Associated electrical distribution and control

1.2 Operation Overview

The malt handling plant operations will be - malt intake, storage, batching, pneumatic conveying transfer to the brewhouse weigh bin, roast malt handling and dust collection.

Intake

The intake system will be similar to the existing arrangement where the malt supplier positions the truck at the intake then locates a retractable conveyor at the discharge point on the truck.

Prior to the commencement of the discharge, the brew house operator selects the silo destination of the malt.

The new and the existing silos, which will be reused, will be fitted with high level, low level and continuous level indicators.

The truck driver then starts the system and shuts down the system when complete.

Malt Storage (excluding Roast Malt)

The three existing Pale Malt silos will be reused and six (6) new Specialty Malt silos will be installed west of the Pale Malt silos.

Due to the site constraints of traffic flow, existing equipment etc. the Specialty silos are some distance from the Pale Malt silos.

The existing Pale Malt silos are fed via the truck unloading conveyors, elevator E1, diverter valve and screw conveyor which feeds the three Pale Malt silos.

The six Specialty Malt silos are fed by the same system as above up to the diverter valve (above) where a gravity spout feeds the first of two drag conveyors above the three silos which then feeds the second drag conveyor and in turn the final three Specialty Malt silos.

Batching System (excluding Roast Malt)

West End Brewing decided, based on plant layout, to weigh the malt ingredients as close to the storage facilities as practical. This has the effect of reducing errors due to in flight compensation especially with smaller ingredient weights.

It was decided to install three inline weighers, one for the Pale Malt silos and two for the six Specialty silos.

The weigher general arrangement is a surge hopper above the weigher where the screw conveyors deliver the malt, the weigher and a dump hopper below the weigher which discharges directly into the rotary valve.

A discharge screw under each malt silo will convey malt to the weigher continuously until the target weight is achieved. The weigher weighs a set quantity, valve on the inlet to the weigher closes, the weigher dumps the weighed amount, closes the outlet valve and opens the inlet valve, weighs the next quantity etc. until the target weight is achieved.

The system would then select another screw discharger, another weigher if not in that group and possibly another blower.

Pneumatic Conveying System

There are two pneumatic conveying systems supplying the grist bin (ex-weigh hopper) with Specialty Malts and Pale Malt. Only one system can operate at a time.

The pneumatic conveying system has a roots type blower providing the conveying air, a rotary valve which allows the malt ingredient to enter the positive pressure conveying line, the conveying pipework, cyclone receiver above the grist bin and a dust collector

Roast Malt System

The Roast Malt system has the following features –

- a. Larger storage silo
- b. Weigh bin for larger quantities of Roasted Malt which can be used as a supply bin for small special batches of malt
- c. Roast Malt intake system using bulk bags and pneumatic conveying to either the large silo or the smaller weigh bin.

The proposed system for adding Roast Malt to grists **other than Southwark Stout** will be by spouting the Roast Malt directly from the larger storage silo to a dedicated inline weigher similar to the larger weighers and this will then discharge into the Pale Malt pneumatic conveying line via a rotary valve.

When Southwark Stout is being batched the system will change to using the existing weigh bin under the Roast Malt silo. The weigh hopper will call for the larger quantity of malt, the main slide gate valve under the silo will open and then close when the desired weight is reached.

Because Southwark Stout has a relatively large quantity of roast malt, a screw conveyor will be installed to convey the malt to the Pale Malt rotary valve system (it will by-pass the Pale Malt weigher)

Dust Collection System

General Exhaust

The existing dust collector will be replaced with a bag type unit with reverse pulse bag cleaning with compressed air. The pulse unit will be certified for dusty environment, the interval and duration of the air pulse will be adjustable within the local controller.

The outlet of the dust collector will be fitted with a discharge screw and rotary valve.

The dust bin and discharge screw will be retained and a dust eliminating telescopic chute will be fitted to the outlet of the existing dust screw conveyor.

The telescopic unloading chute will have a local operator panel which will control the extension of the chute and the starting of the dust discharge system.

Exhaust ductwork will be run from the dust collector to the various points shown on the flow diagram where manual control valves will be fitted.

Pneumatic Conveying Exhaust

The conveying air for pneumatic conveying systems has to be exhausted at the receiver above the grist bin. A dust collector will be positioned above the receiver to discharge the air. The unit will be similar in principle to the general exhaust dust collector with reverse pulse continuous bag cleaning.

Roast Malt

The Roast Malt intake system will be fitted with a small stand-alone unit to exhaust the tip point and the rotary valve. Again the unit will be similar in principle to the above dust collectors.

1.3 Plant Design Parameters

Intake Rate	60 tonne per hour
Transfer Rate	15 tonne per hour

Pneumatic Transfer - Blower

Blower Design Pressure	55 kPag
Blower Design Volume	1200 m ³ /hr
Blower Motor size	37 kW
Motor Speed	2960 rpm

Pneumatic Transfer – Blower – Roast Malt

Blower Design Pressure	40 kPag
Blower Design Volume	720 m ³ /hr
Blower Motor size	15 kW
Motor Speed	2950 rpm

Dust Collection / Filtering

Dust from intake operations to waste

Dust from transfer operations to return to process

Required Malt Weighing Accuracies

- | | |
|------------------|--------------------------|
| • Roast Malt | Better than ± 0.5 kg |
| • Specialty Malt | $\pm 0.5\%$ |
| • Pale Malt | $\pm 0.5\%$ |

Properties of Malt

- Density 500 - 600kg/m³
- Minimum Ignition Energy 0.035 J
- Minimum Explosion Concentration(C) 30 g/m³
- Cloud ignition temp (T_c) 400°C
- Layer ignition temp (T_L) 250°C
- Ignition sensitivity 2.6
- Explosion severity 2.1

1.4 Compliance Standards

The following compliance standards and regulatory guides have been followed for the design and installation of the Malt Handling Plant:

- AS1755-2000 Conveyors – Safety Requirements.
- AS3000 Wiring Rules – Electrical Installations
- AS1657-2013 Fixed platforms, walkways, stairways and ladders - design, construction and installation
- AS4024 General principles of machine safety and guarding
- AS1319 Safety signs for the occupational environment
- AS 60204.1 Electrical Equipment of machines (designed to complement AS4024 and AS3000)
- AS61508 Functional safety of electrical/ electronic/ programmable electronic safety related systems.
- AS61241 Electrical apparatus for use in the presence of combustible dust - General requirements
- NFPA 68 Guide for Venting of Deflagrations
- AS 3774:1996 Loads on bulk solids containers
- AS/NZS 4745:2012 Code of practice for handling combustible dusts
- Work Health and Safety Regulations 2012 (SA)