



Automated Truck & Train Sampling System (ATTSS)

Contact us directly.

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What does it do?



The Automated Truck & Train Sampling System (ATTSS) takes one or several representative and unbiased sample(s) of each incoming or outgoing truck or train load according to relevant sampling standards (ISO, ASTM/ASME, GOST etc.).

Can be used for virtually any type of bulk materials.

What's the benefit?

- Fully representative and unbiased samples taken in the X, Y and Z axis of load at a completely random point.
 - So you know exactly what you are buying or selling (no-one will cheat you ever again!).
- Fully automated: No plant staff needed.
- Proven technology for 20 years: Installed at 7 different plants – 3 during 2017-20. All in operation.
- Camera monitoring and detection system removes risk of damaging truck, sampling unit and humans during sampling.
- Can be used for all kinds of bulk materials:
 - Biomass
 - Metals and non-metals concentrates, crushed ores, iron fines
 - Coal and coke
 - Granular materials (fertilizer, potash, plastics, feedstuff, and grain)
 - Powders (limestone, mineral powder, pelletized sulphur)
- Annual savings of Euro/USD 150-500,000.
- High availability and requires very little maintenance (robust).

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How does it do it?

The Automated Truck & Train Sampling System (ATTSS) takes a fully representative and unbiased sample in the X, Y and Z axis at a completely random point of the truck or train load - so you know exactly what you are buying or selling (no-one will cheat you ever again). All steps in the Automated Truck & Train Sampling System process are explained below:



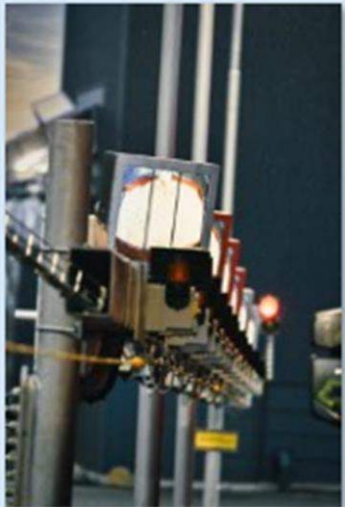
At the **weighbridge truck registration point**: The driver receives a **unique sampling label** for final sample identifying supplier and truck.



Activation panel: The driver selects truck with trailer or only truck, tip trailer or walking floor and starts the sampling process – one or several samples per load is selected.

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The randomizer and light generation system calculates the chosen random sampling point, and the lighting system (up to 15 lights) guides the driver and truck to the first or second random sampling location.



The camera monitoring and detection system ensures that the driver can activate the sampling unit without risk of hurting truck, sampling unit or humans during sampling. The monitoring system can also be available to the control room if needed. The driver activates the sampling unit by pushing a button.

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The sampling wagon on the gantry structure is activated and moves the sampling head to a random position in the width of the truck.



The automated weather cover is activated ensuring that no rain or snow enters the sampling bucket during sampling.



The sampling head is automatically activated and collects a representative sample at a random point in the depth of the truck load.

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The sampling head delivers the taken sample to **the sampling receiver (hopper)** inside the small sampling house. The sampling receiver is kept clean from contamination between each sample by means of the **vibration and air cleaning unit**.

The taken sample is delivered into an empty bucket below the sampling receiver. The driver closes the bucket with a lid and attaches the unique sampling label. The representative sample can then be taken for further analysis.

An emergency wire below the activation button can be pulled at any time by the driver from inside the truck stopping the sampling unit if need be.

To optimize security 5 different emergency stops are located at critical areas around the sampling system.



Included in the system is a **Control Cabinet with HMI** – unless agreed otherwise. Also included is surrounding steel structure, platforms and small sampling house – unless agreed otherwise.

The PLC can be programmed allowing the sampling system to take one or multiple samples from the same truck load.

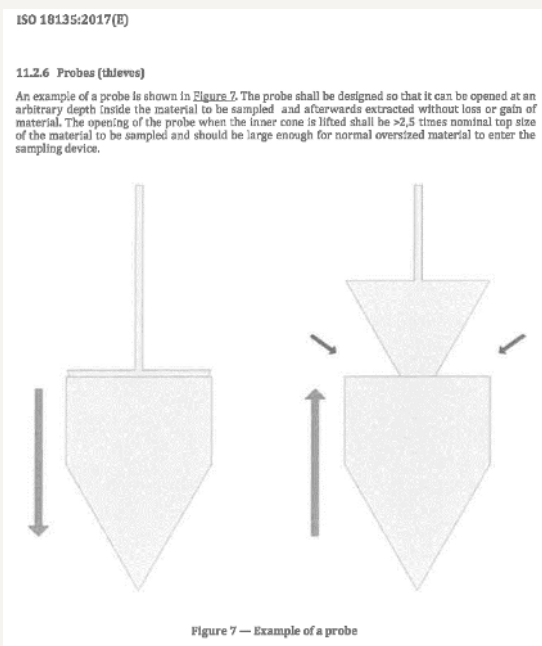
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What is the standard?

M&W JAWO Sampling equipment and sampling systems operate in accordance with approved international material standards such as ISO, ASME, GOST, EN as well as DS3077 (2013). All sampling equipment and solutions aim for compliance with the principles laid down in the Theory of Sampling (TOS) and gives our customers reliable knowledge of the material properties such as moisture content, particle size distribution, mineral proportions, and content grade essential for commercial, operational, and technical characterization. All standards are visible below:

ISO 18135:2017 for biomass



ASTM D740/D743M-21 for coal

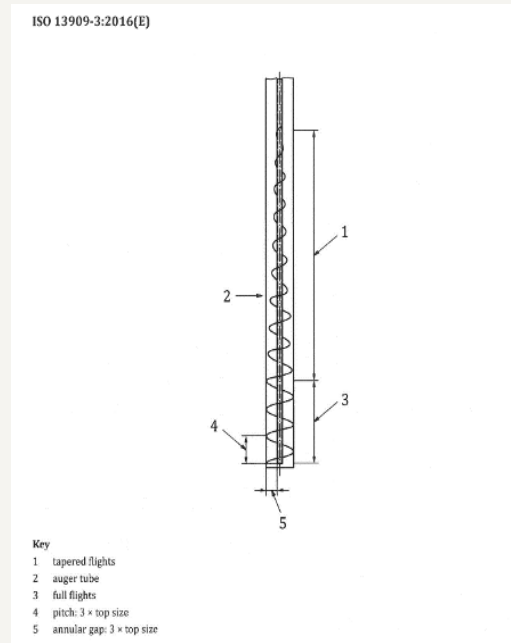
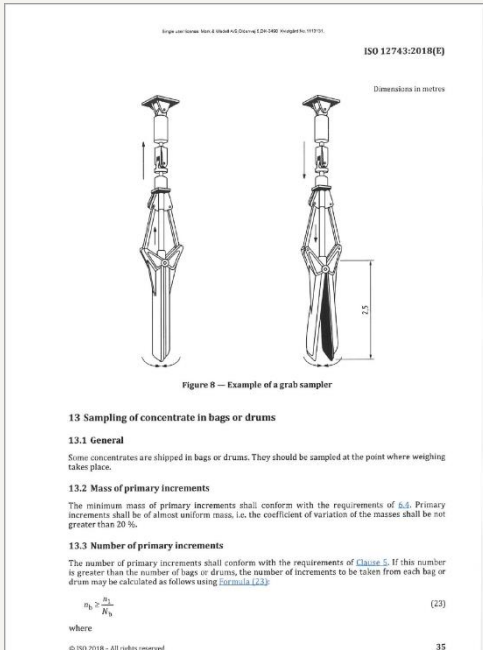


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ISO 12743:2018 (E) for copper, lead, zinc and nickel concentrates - Sampling procedures for determination of metal and

ISO 13909-3:2016 for hard coal and coke - sampling from stationary lots



Endorsed by sampling specialists:
"Representative sampling of wood chips - A contribution to fulfill the Kyoto protocol"
Source: 2nd World Conference on Sampling and Blending - Australia (2005)

Representative Sampling of Wood Chips — A Contribution to Fulfill the Kyoto Protocol
H S Møller¹ and K H Esbensen²

EXTENDED ABSTRACT

During the next five years Denmark will implement a significant reduction in the national CO₂ emissions to fulfil the Kyoto Protocol. The energy sector is central for achieving this goal and extensive use of renewable energy is the most important single factor contributing to reduce emissions of greenhouse gases. Denmark's renewable energy sources comprise wind energy and biomass. Wood chips and straw are the dominant type of biomass in Denmark. More than 500 000 tons of wood chips are used annually, currently with rapidly growth prospects. This contribution focuses on sampling of wood chips.

Wood chips are currently supplied to combined heat and power plants (CHP) in truckloads of approximately 100 m³ (100 000 L) (see Figure 1). Determining the average moisture content of each truckload is mandatory for accounting and process control. For this purpose, a hydraulically driven vertical sampler is used to extract primary increments, each consisting of approximately 10 L of wood chips (see Figure 2). The design of this sampler enables representative increments to be taken from any given horizontal location in the lot (truckload surface) (see Figure 3). Thus the Fundamental Sampling Principle (FSP) can be applied.

Current procedures, which were designed without consideration of the Theory of Sampling (TOS), stipulate only one increment for each truckload, located at random in the truckload pile. This singular method, located at random in the truckload pile. This singular method, located at random in the truckload pile. This singular method, located at random in the truckload pile.

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Fig 1 - Single truckload capacity, approximately 10³ L.

Fig 2 - Vertical, pneumatically driven sampler; sampling chamber contains approximately 10 L.

Fig 3 - Close-up of sampler at work.

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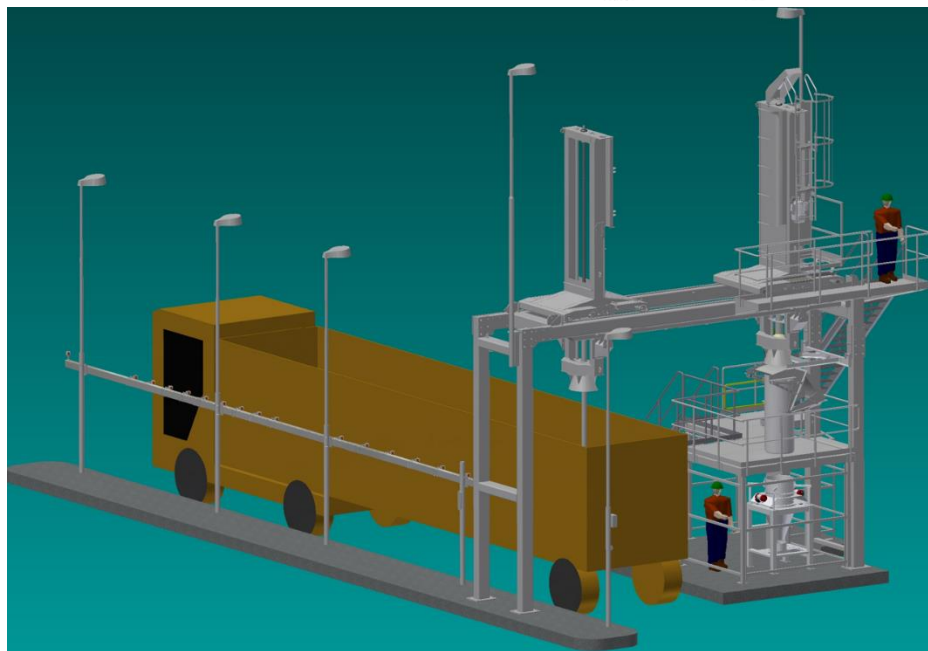
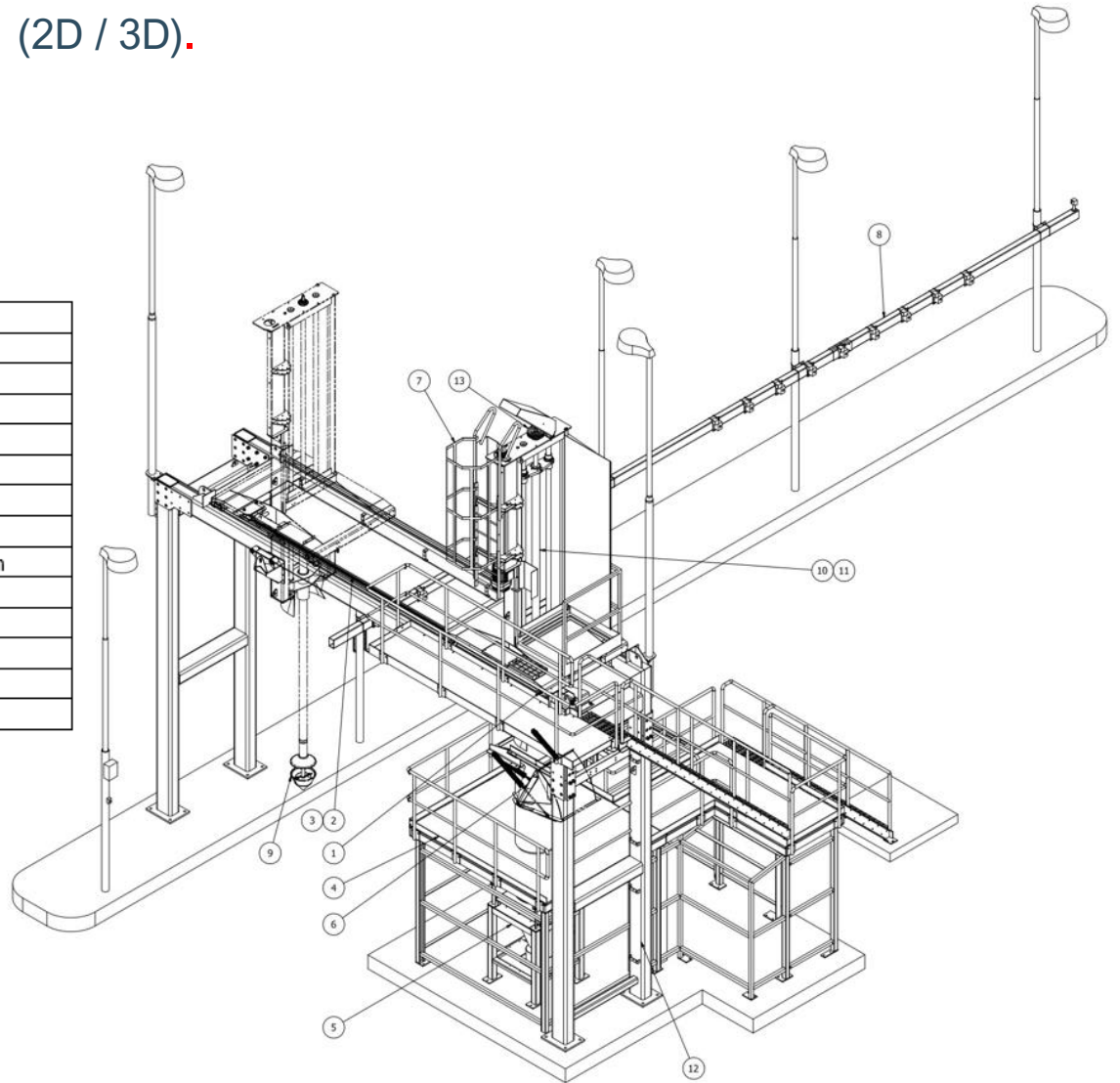
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Drawing (2D / 3D).

Item	Description
1	Sampling wagon
2	Horizontal drive
3	Horizontal drive arr.
4	Stand and platforms
5	Sampling receiver
6	Weather cover
7	Service ladder
8	Randomizer & light system
9	Sampling head/probe
10	Probe stand
11	Probe stand arr.
12	Frame
13	Vertical drive unit

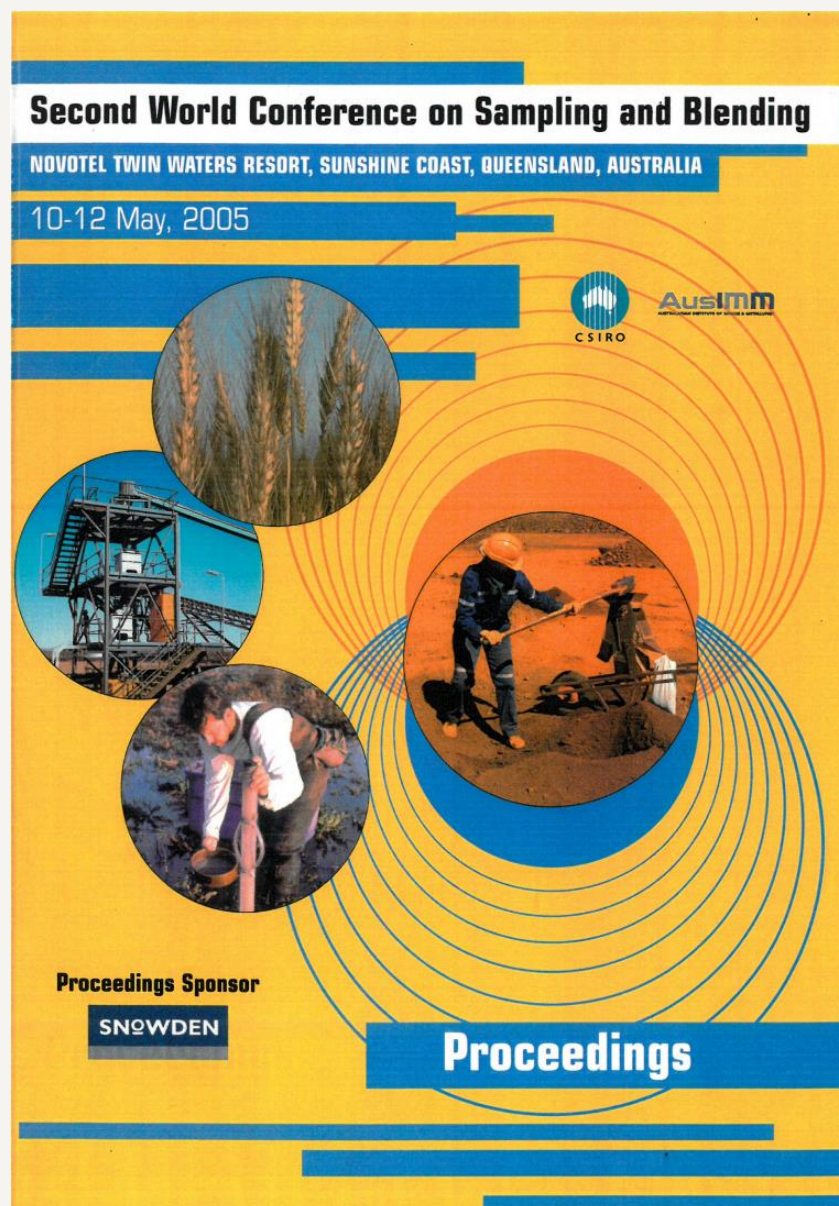


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What were the experts' test results?

In 2005 H.S. Møller of Elsam Engineering, Chemistry and Materials (now Ørsted) and K.H. Esbensen, Professor of Sampling (University of Aalborg) conducted a study of the different moisture results obtained from grab sampling compared to auto-sampling using the M&W JAWO Automated Truck & Train Sampling System for biomass received by truck. The study was published in "Second World Conference on Sampling and Blending" held in Australia.



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“Determining the average moisture content of each truckload is mandatory for accounting and process control. For this purpose, a hydraulically driven vertical sampler is used to extract primary increments, each consisting of approximately 10 L of wood chips (See figure 2). The design of this sampler enables representative increments/samples to be taken from any given horizontal location in the lot (truckload surface) (See figure 3). Thus, the Fundamental Sampling Principle (FSP) can be upheld.”

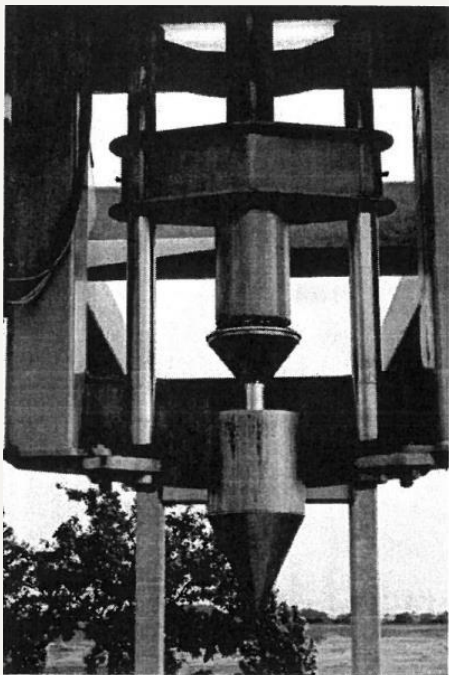


FIG 2 - Vertical, pneumatically driven sampler: sampling chamber contains approximately 10 L.



FIG 3 - Close-up of sampler at work

We compared this new composite sampling to the conventional grab-samples and quantify the improvements for the critical moisture component.....the results from the first part of a six-month longitudinal study, displays a clear systematic deviation (on average a deviation of -1.5 per cent moisture). Economically this amounts to savings of the order of 2 M Euro over a ten-year period (which is to pay for unrecognized excess moisture due to inferior sampling)” (Møller & Esbensen 2005)

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Variants/Options.

Variant 1:

The ATTSS is supplied with a sampling head in form of a probe as a (standard).

Variant 2:

The ATTSS can also be supplied with an auger instead of a probe. In some cases, in combination with a divider to split material into sub-samples.

Option 1.

The M&W central control cabinet can exchange signals with the client's control system.

Option 2.

The ATTSS can be delivered together with a Rotary Tube Divider for further splitting of sampled material into sub-samples.

Option 3.

For Particle Size Distribution analysis, a Vibration Sieve can be included.

Option 4.

For real-time moisture determination, the ATTSS can be provided with a NIR (Near Infra-Red) and/or MW (Micro wave) unit.



Option 2 (Rotary Tube Divider)



Option 3 (Vibration Sieve)

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About M&W.



Mark & Wedell A/S (M&W) is a global mechanical/electrical engineering and manufacturing company. M&W serves a solid and growing international customer base within the global mining-, minerals-, metals-, power generation- and big science markets.

We develop, engineer, and produce high quality mechanical and electrical machines, instruments, and solutions. Our brand JAWO and unique know-how is well recognized in our markets and among our customers due to more than 40 years of experience.

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