Odour Control/Smell Removal from Fish and Animal Byproducts Processing Plants

A & S Thai Works

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Shell and tube condenser and air-cooled condenser at ASTW vacuum fish meal plant in Malaysia

Odour control/smell removal from fish and animal byproducts processing plants

Smell removal (odour control or deodorising) is becoming increasingly important in the fishmeal and meat and bone rendering industries, with stricter regulations issued by governments all over the world. The ASTW smell removal systems are composed of one or more elements as described in the following chapters. The systems are divided into 6 main categories:

- Condensing (cooling)
- Scrubbing (washing with water)
- Chemical (additive)
- Ozone (added to the rest gas)
- Burning in boiler or themal oxidiser
- Bio-filter

Combinations of these systems can be used. It is important to combine calculations and experience to get the system to work correctly.

Note that only the condensers, air-cooled and/or shell and tube, can cool down and condense the vapour, while the other methods only remove the smell.

Waste Heat Evaporators

The main purpose of a waste heat evaporator (WHE) is to save energy at oily fish meal plants and low temperature rendering plants. The WHE utilises the waste heat from the drier to evaporate moisture from the stick water before the consentrate is returned to the drier. A secondary effect is that it condenses waste steam and contributes to the smell removal process.

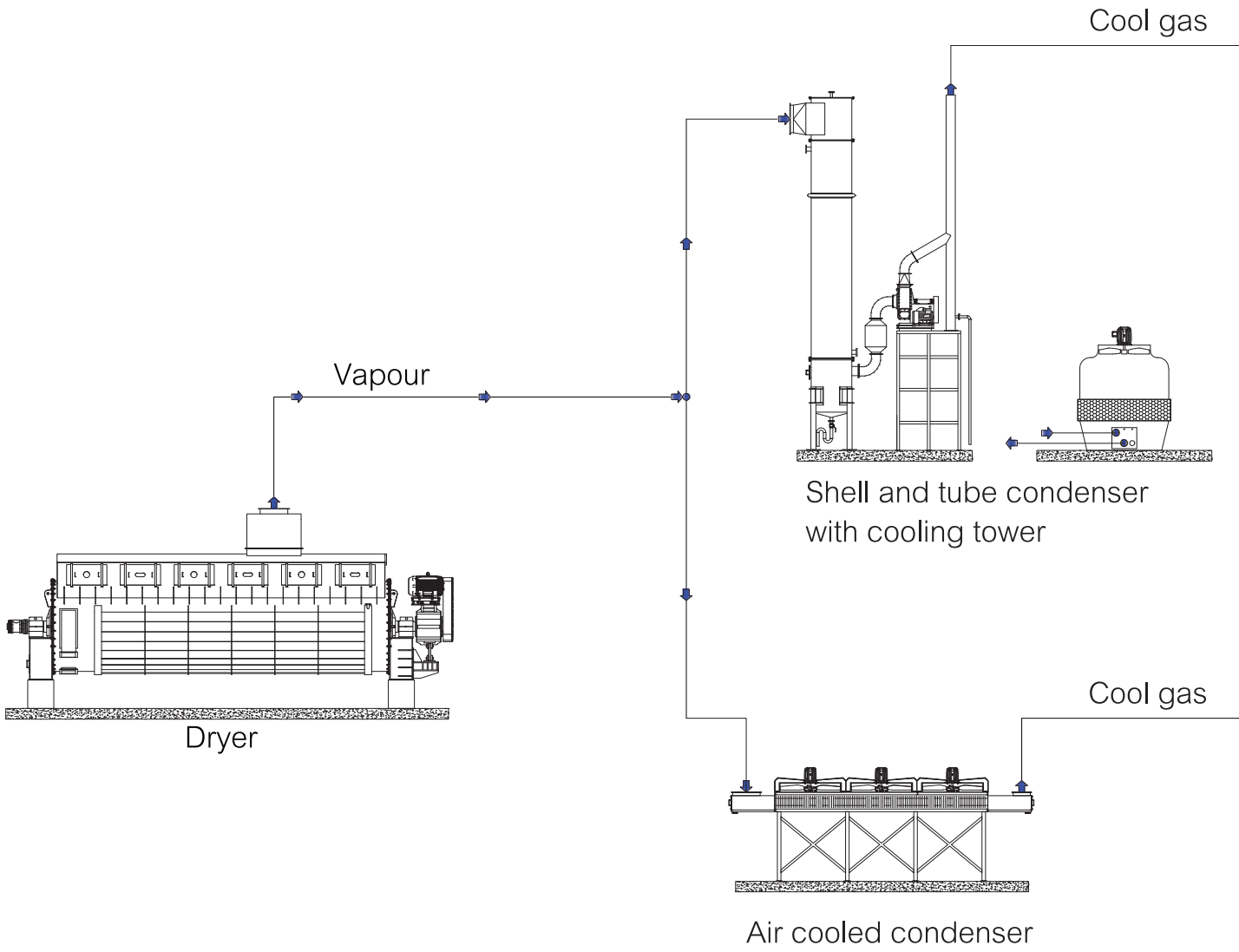
WHE's will not be discussed as a separate item in this brochure as it is primarily an energy saving device. Please ask ASTW for more information.

Front cover photo: Air-cooled condenser at ASTW vacuum fish meal plant in Malaysia

Back cover photo: One of the two ASTW workshops in Samut Prakan on the outskirts of Bangkok

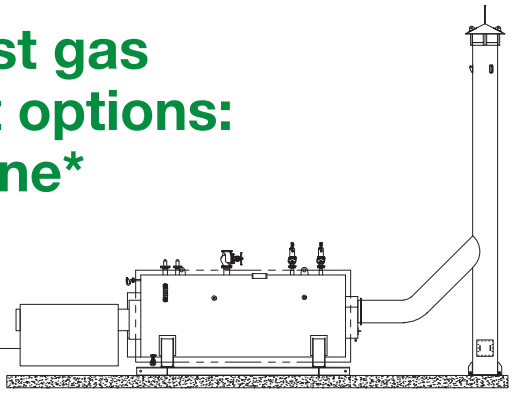
Drying

Cooling options: Choose one or both



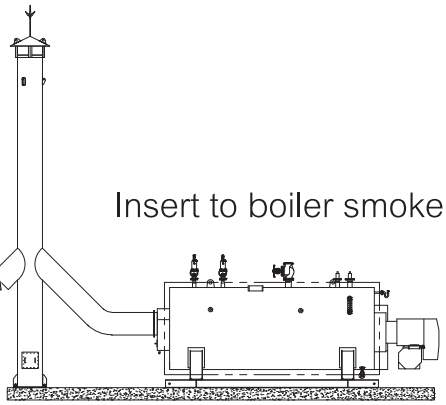
ASTW offers tailor made odour control solutions that are suitable for most requirements and needs.

Smelly rest gas treatment options: Choose one*



Burn in solid fuel boiler

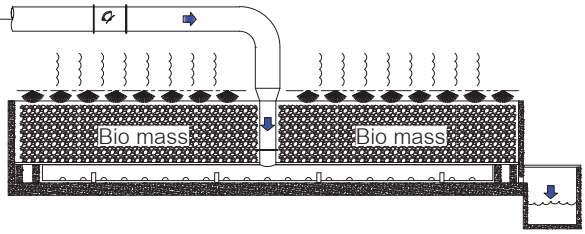
1



Insert to boiler smoke stack (solid,oil or gas boiler)

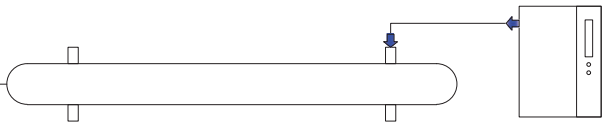
2

3



Biofilter

*Biofilter can also be used as a final step after a water scrubber or ozone treatment.

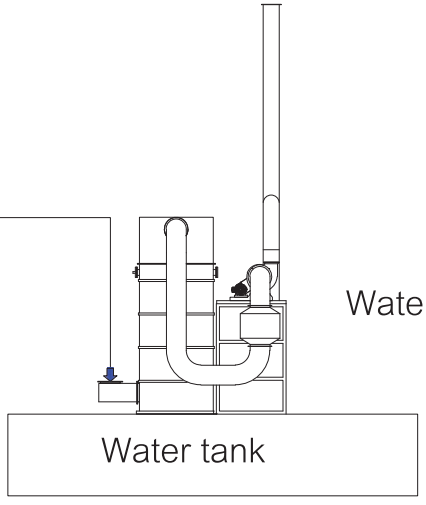


Ozone treatment

4

Ozone generator

5



Water scrubber

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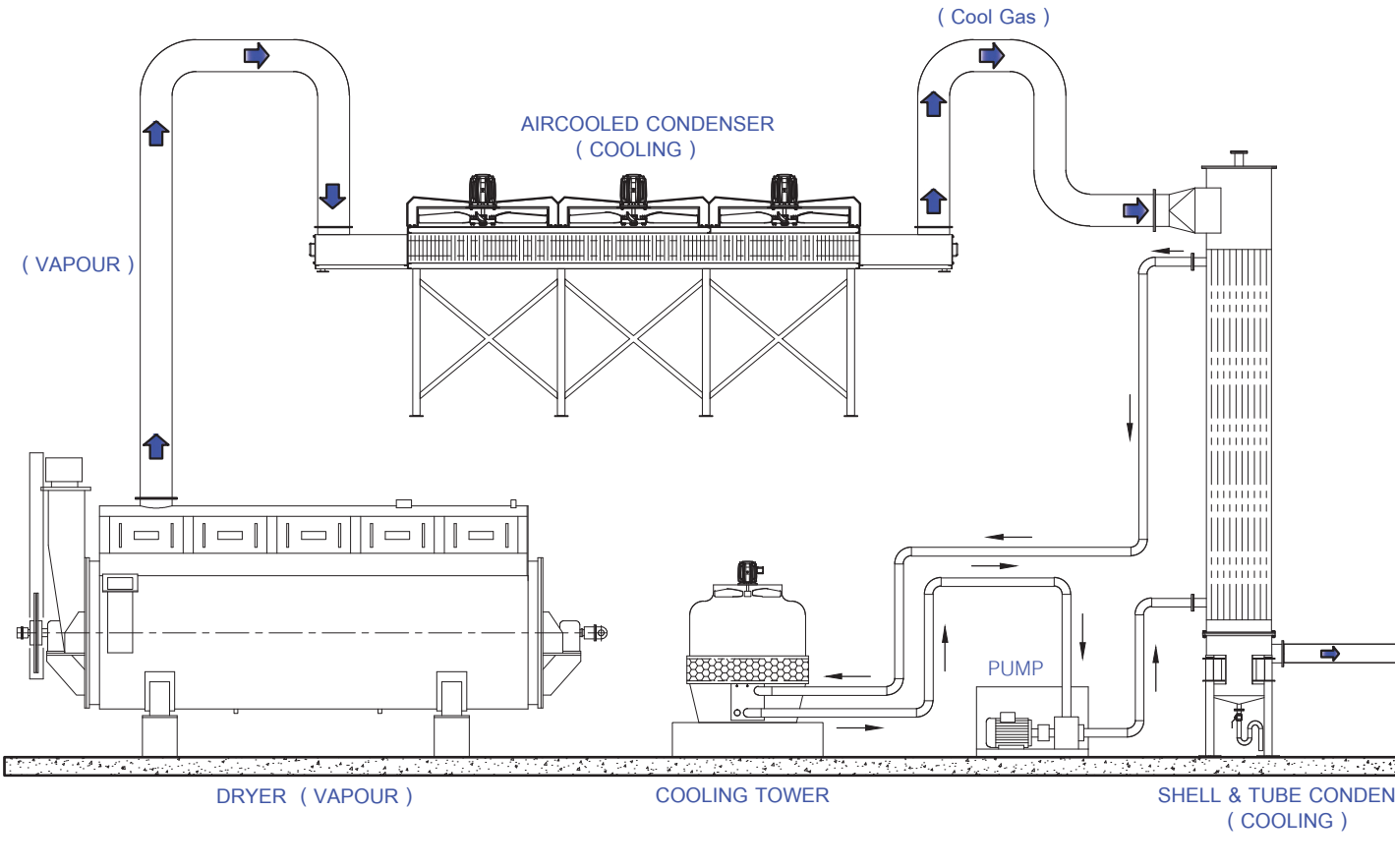
Air-cooled condenser

The ASTW air-cooled condenser uses ambient air to cool down and condense waste vapour from the drier. One standard unit consists of high capacity ventilators (fans) that blow ambient air past stainless steel tubes with cooling fins. The system is lightweight, easy to install and virtually maintenance free. Since ambient temperature air is used, this method is most efficient as the first step of the smell removal process when the temperature of the waste vapour is at its highest.

At 35 degrees Celsius ambient temperature, one standard unit with 3 ventilators will condense a minimum of 1.5 tons of vapour per hour. One standard unit will fit into a 40 foot container.

Air-cooled condenser at ASTW fish meal plant in Namibia



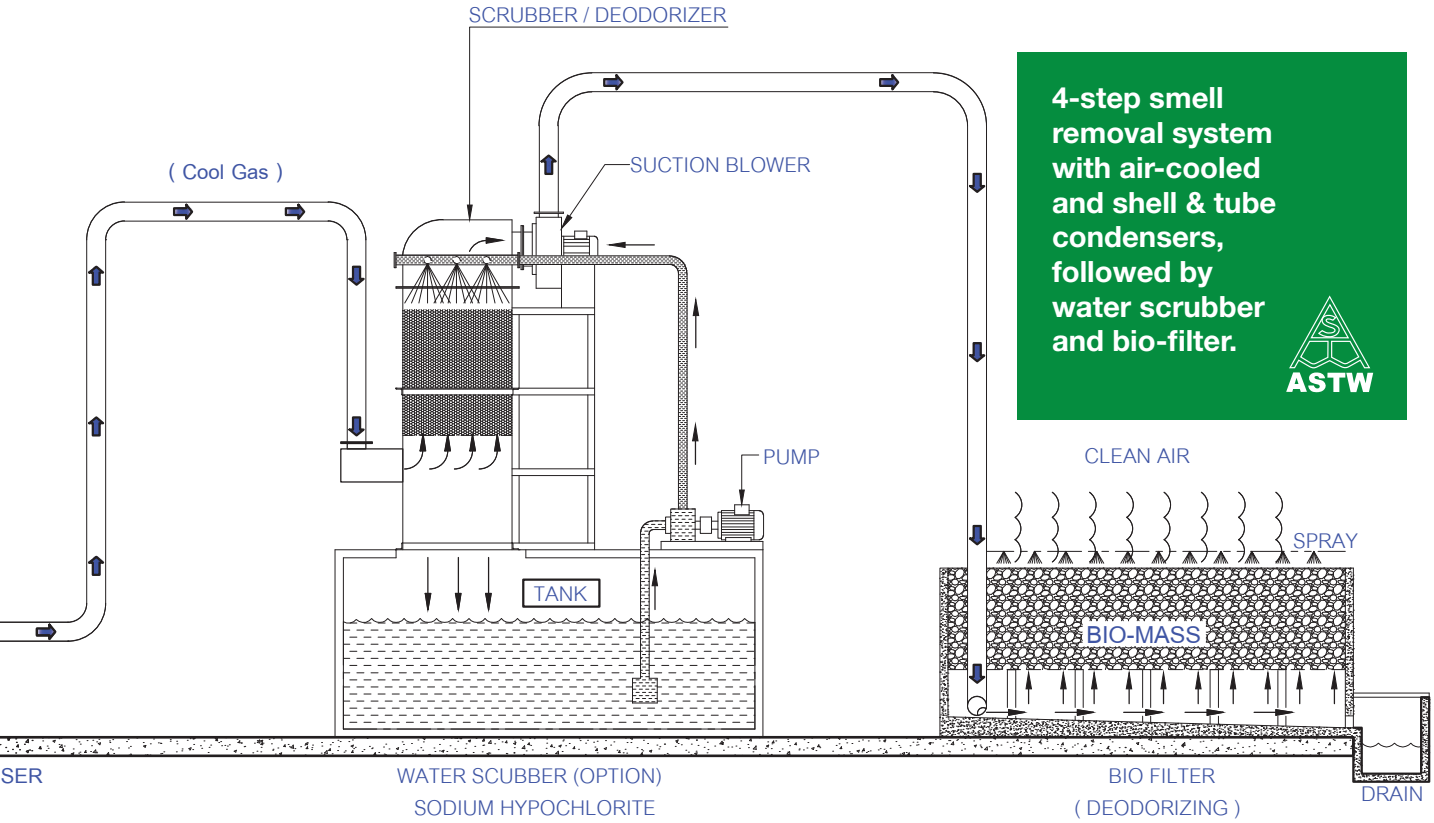
Shell & tube condenser at ASTW fish meal plant in Thailand

Shell & tube condenser

The ASTW shell & tube condenser sues cooled water that surround stainless tubes to condense waste vapour running inside the tubes. It uses a cooling tower to cool the water, and the size of the cooling tower is important to create the correct condensation of vapour. The cooling water is recycled but some water evaporates, so about 2-3% of the circulation volume of fresh water has to be added per hour (Example: with 300 ton/hr circulation, 6 tons of fresh water/hr needs to be added).

Since the condensing effect is dependent on the size and capacity of the dryer and how much air is mixed with the vapour, the capacity will have to be calculated individually for each plant.

Sometimes an air-cooled condenser is installed before a shell and tube condensers to save on fresh water consumption.



4-step smell removal system with air-cooled and shell & tube condensers, followed by water scrubber and bio-filter.

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Water scrubber

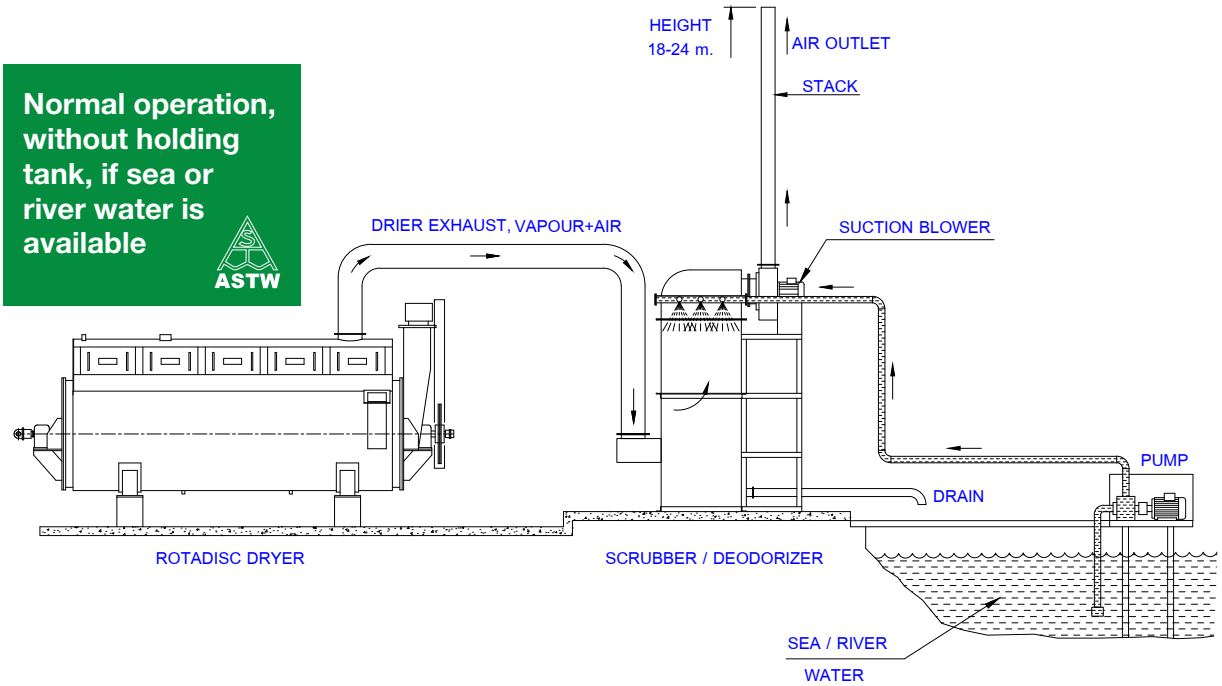
The ASTW water scrubber uses a large volume of water to wash away the remaining smell in the waste vapour and rest gas. The amount of water needed will vary with the size of the plant and the amount of smell removal performed during previous steps as described above. If a high volume of water from sea or river is available, it is possible to use a water scrubber as the only condensation and smell removal method, volume about 45 m3 water per one ton of plant capacity. The cooling water heats up about 10 degrees and goes back to the sea or river without causing pollution. If the scrubber is used only for smell removal in rest gas that has already been cooled, the water can run in a closed system from a holding tank. However, in most cases a combination of methods must be used.

Water scrubber with holding tank at ASTW fish meal plant in Vietnam

Chemical additives

It is possible to continuously mix a small volume of sodiumhypochlorite (normal clothing bleach) into the closed system scrubber to remove the smell from the rest gas. This simple method is especially useful when the air from the building and "point suction" from each individual machine is to be deodorised but does not need to be cooled down.

Normal operation, without holding tank, if sea or river water is available

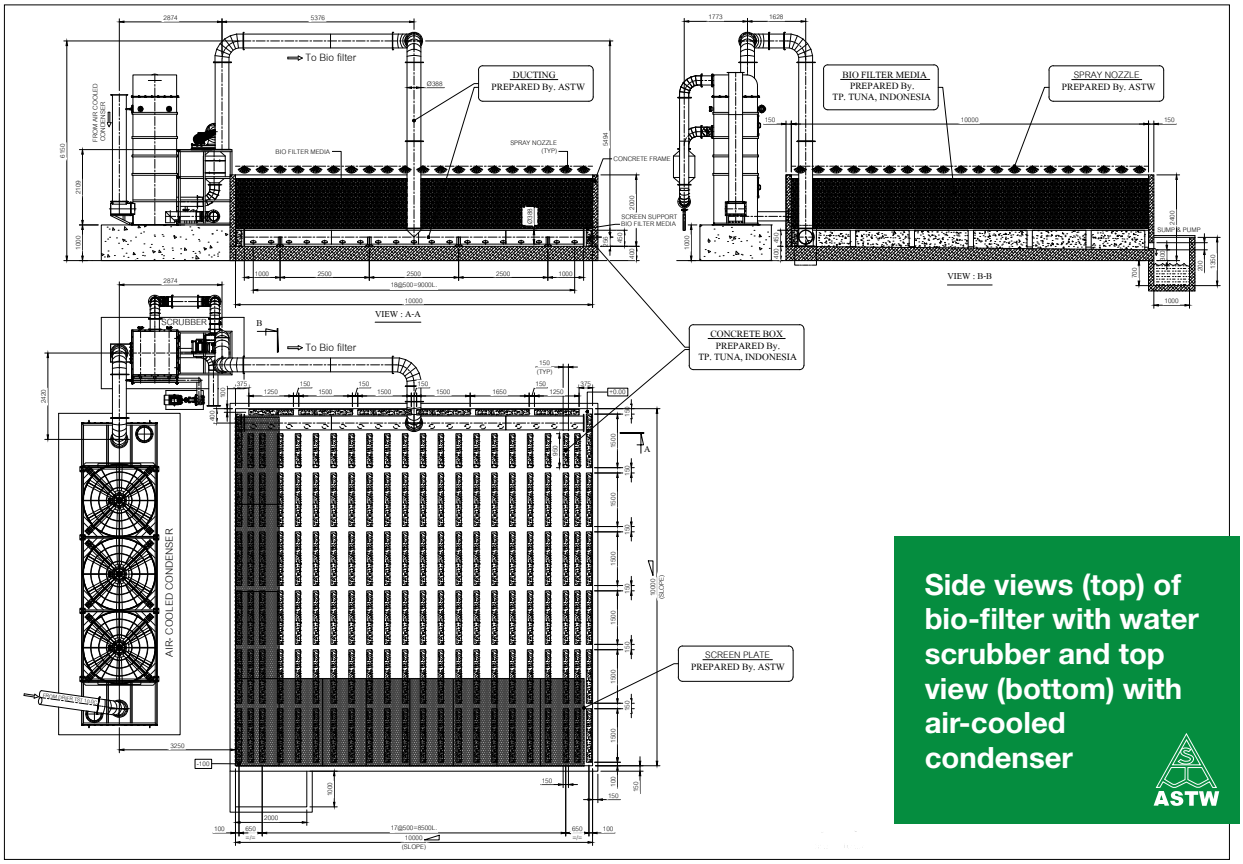


Bio-filter

The bio-filter is a large (typically 10 x 20 x 2 metres or larger) basin like a swimming pool where the smelly rest gas is slowly filtered from the bottom through a layer of “bio media” like coconut husks, tree bark, rice husk or similar bio materials after having been cooled down and condensed to less than 40 deg C.

The naturally occurring bacteria in the filter will “eat” the remaining smell molecules. ASTW can supply drawings for the filter basin and supply all mechanical components and ducting. After some time, the filter material or bio media will turn into fertile earth and will have to be replaced.

The three photos to the left show three stages of construction of a bio-filter at an ASTW fish meal plant in Indonesia. At this plant, coconut husks are used as “bio media”.

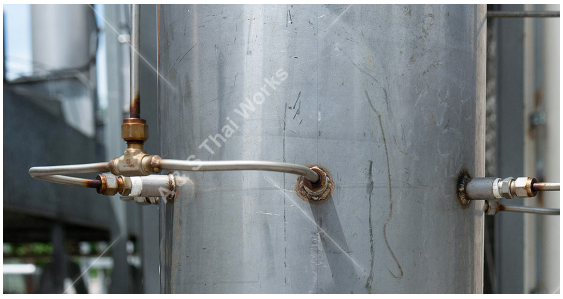


Side views (top) of bio-filter with water scrubber and top view (bottom) with air-cooled condenser

Ozone treatment

The ozone treatment system consists of an ozone generator, producing ozone (O^3 or tri-oxygen) from the oxygen in the air (O^3 or di-oxygen), a control unit and a dosing system. Ozone has a highly reactive oxygen atom and is very quick to react with smell particles that it comes into contact with.

The extra oxygen atom in the ozone attaches itself to the smell molecules, chemically changing their structure to create non-offensive molecules and thereby eliminating the smell. The ozone treatment system is automated with sensors to ensure that the right smount of ozone is generated to match the amount of smell molecules in the rest gas stream.



Ozone insertion nozzles at fishmeal plant in Thailand

Ozone generating system at fishmeal plant in Thailand

Burning of the smell

As an alternative last step, the remaining smelly rest gas can be burned in a soild fuel boiler or led to the smoke stack of the steam boiler to mix with flue gas. The flue gas ions and high temperature in the boiler and stack will burn and neutralies the remaining smell molecules.

Regenerative thermal oxidiser

This is is a large, technically advanced unit that will burn and deodorise all vapours and gases from the plant and remove all smell 100%

The unit is highly efficient but very expensive and sus burners that consume fuel oil or gas which increases the operating costs dramatically.

It is mostly used for large processing plant close to cities and population.

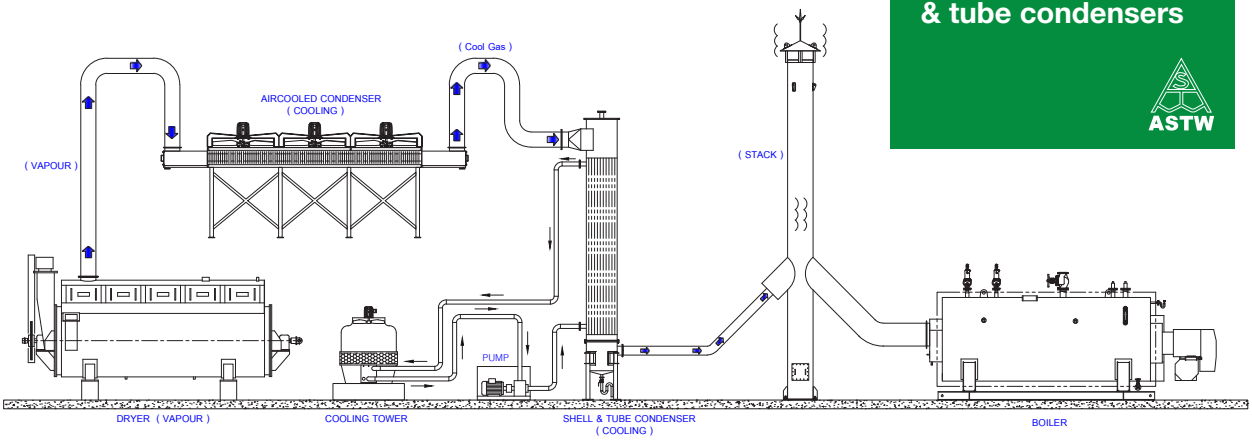
Negative pressure building and sustion points

It is important for the romoval of smell that the processing building is enclosed, including the raw material storage bin area. Negative pressure building means that air can only enter the building through doors and windows and only escape through the smell removal system. There will be suction points at certain machines to remove smelly vapour and air in a controlled manner. The smelly vapour and air will go to a water scrubber or bio filter for treatment.

ASTW can dosing and supply equipment for these systems and give advice on how to make suction points and a negative pressure building.

Air-cooled and shell & tube condensers at fishmeal plant in Thailand

Burning of rest gas in boiler stack after air-cooled and shell & tube condensers



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