INSECT ENGINEERS

Offer

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Dear Julian / William,

During our pleasant conversations we discussed the development of a new high-tech BSF farm that complies with the latest innovations in the market.
Insect Engineers will assist you during the whole process by providing engineering, supplies, climate, machinery and consultancy & training.

You told me that you are looking for a good production solution that can help grow BSF on a large scale and that is economically attractive.

You do not want any concerns, which is why we will assist you throughout the process of setting up your farm.
We will provide high-quality products that are functional, safe and user friendly.
Our goal is to make your business as effective and efficient as possible.

The following pages explain how we are going to help you set this up. The offer has the purpose to give you a better understanding of the investment involved. Please also take the effort to read all the pages involved.

We trust this information suffices for your purposes. We are convinced to have made you a suitable offer.

A movie of our production system with ZOEM racks can be found online on https://www.insectengineers.com/production.

If you have any further questions, feel free to contact us.

Met hartelijke groet ~ With kind regards ~ Atentamente ~ Mit herzlichen Grüßen,

BOB HOLTERMANS
Insect Engineers BV
Machinery | Climate | Supplies | Engineering

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Introduction

When talking about the waste processing capacity per day or year. You can have 2 fully identical farms but with different capacities. Because capacity depends on:

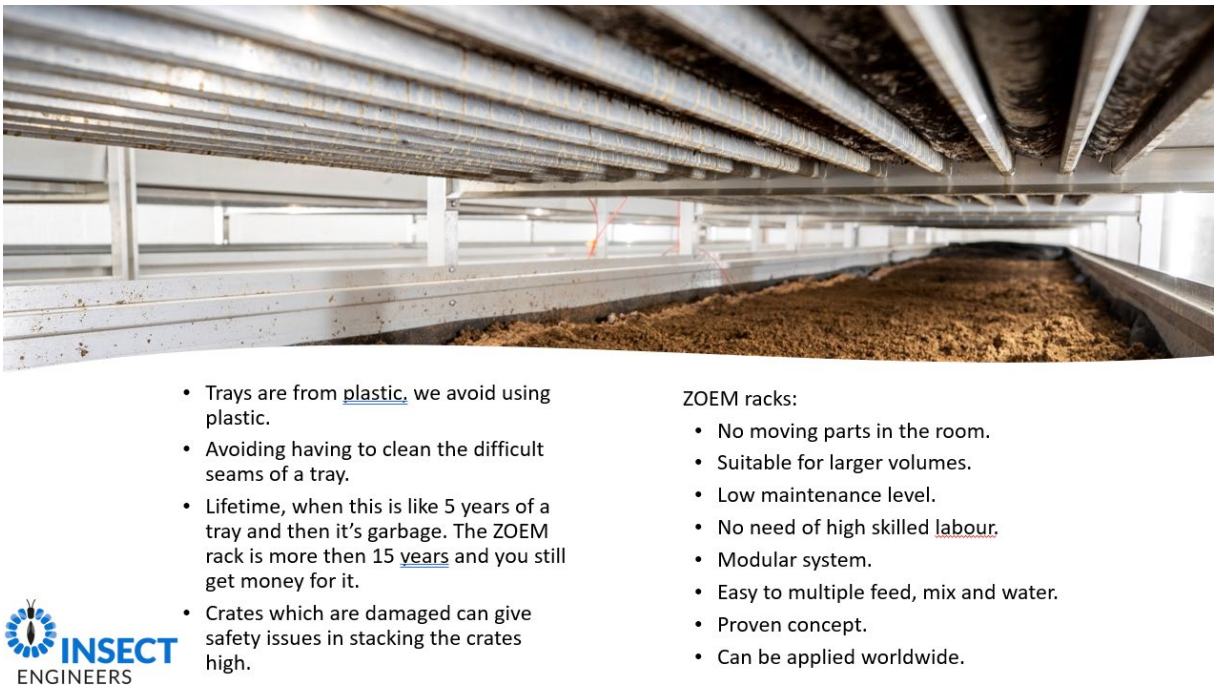
- Density, meaning what is the weight per m3 of your substrate. For example 550kg per m3 or 750kg per m3. Knowing that growing BSF always has a limitation in the height of the substrate. So when that for example is maximum 10cm then the combination with the density decides your capacity.
- Multiple feed. The ZOEM rack system offers a convenient way of additional feeding during the production (5-14 day) process. For example your maximum height is 10cm but you choose to fill 8cm on day 1 and another 4cm on day 2. Then in the end your capacity was 12cm, which is 20% more.
- Amount of larvae. How many larvae will you add per cm2? In other words “how many people you invite for diner”. If I add more larvae the eating capacity is higher. The best choice in this is simply what gives the best cost price.

ZOEM Racks vs Trays

Of course it's a logic question to ask. Why should I choose for the ZOEM rack system instead of using trays. In the end the facts speak for themselves, but let's highlight a few.

- Growing BSF is a farming operation. Using trays is based on a logistic warehouse system. But with farming we have to deal with heat, moist, co2 and perhaps even ammonia. All these things are no good for electronics. So if you want to have a reliable production system you need to rule out these risks.
- The flexibility the ZOEM racks offer in growing outperform any tray system.
    - We can multiple feed, so if your maximum substrate layer is 10cm then that is you limitation in a tray. With the ZOEM rack we could do for example 8cm of substrate on day 1 and add 4cm on day 4 which makes it 12cm, which is 20% more.
    - We can mix during production. Can be very beneficial because often the top layer dries out, but by being able to mix the substrate during the production you can mix in the dry feed with the layer below which is more wet. Which leads to better conversion of the substrate because the larvae are able to consume again the top layer.
    - Water management. Recent growing has indicated that playing around with water (can be both adding as getting rid of it) benefits the yield and animal welfare. For your view: In 2 minutes you could add water to a complete ZOEM rack room containing 50 tons of substrate. This all is only possible with the ZOEM rack system.

So we think the ZOEM rack system would always perform better than the tray system. So not only on initial investment or operational cost like maintenance, also when it comes to yield.



Basic Design Data

Production Room:	
Number of rooms	9 production rooms *(each room equals 1 panel building)*
Number of ZOEM racks	2 racks per room
Number of levels per ZOEM rack	7 levels high
Outside width of the ZOEM rack	± 1.50 m
Length of the ZOEM rack	30 m each
Growing surface per room	± 609 m^2
Room dimensions	± 34,00 x 5,96m x 4,03 m (L x W x H)
Function of the growing room	Production of Black Soldier Fly
Approximate production of larvae	Can be discussed. *(output depends on input)**
Growing schedule production	9 days
Requested amount of substrate per day	± 50 ton per day. Large variable because this is also depending on height of substrate, density, etc. See also feedback on page 4.

Outdoor conditions:	
Location:	Manor Farm | Holbeach | Lincs | PE12 8LR
Summer	25 °C – RH = 74 %
Winter	-0,5 °C
Altitude above sea level	28 meter(s) above sea level
Raw materials:	Currently planned: 50t of Apples Pears Avocados per day 60t of Bread per week 30t of Potatoes per week 2 t of brewing grains per day 2t of Agriculture grains per day 5t of Oat husks per week 1t of Stilton wheat and curds per week

These figures must be double-checked by the customer.
Incomplete or incorrect information can lead to adjustments to machinery layout and price.

In a BSF farm, we recognize 3 steps:

- Breeding
- Production
- Processing

The following pages provide more details about these three process steps.

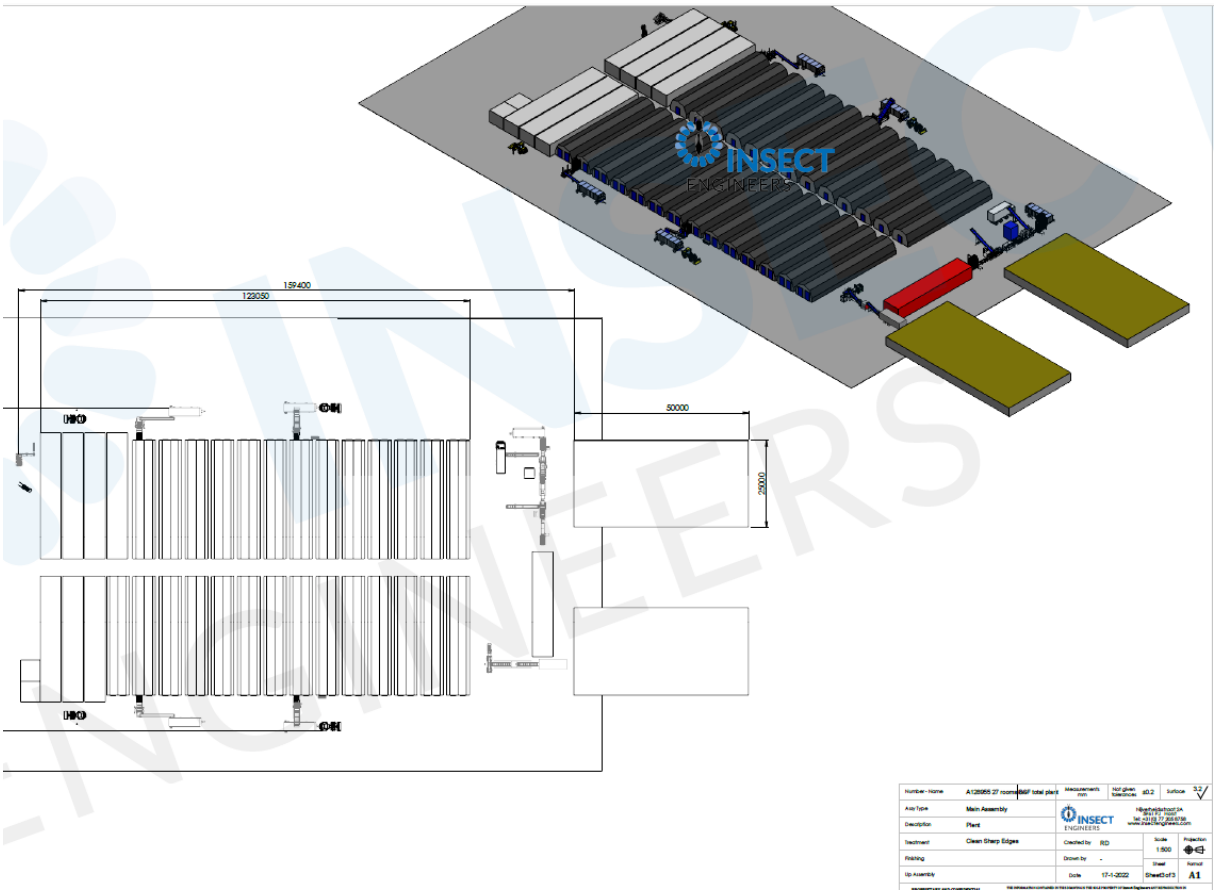
* As mentioned, output depends on input. So you ask what to expect from our system, but that for largest part also depends on the raw materials you use as substrate. We advise customers to calculate with 18% (100kg of wet substrate gives 18kg of wet larvae) as a starting point in their business plan, let's say for the first 4 months. With more experience you should also be able to reach 25%. Do understand that your raw materials decide. If you have high nutritious feed like fruit waste it can also be higher. For us it's important that you understand that the higher number doesn't mean it's valid for every customer. For that reason I mention 2 numbers because just giving one number can give you wrong insight and makes you do wrong calculations. When we make a business plan we would advise to calculate with the above. At same time keep in mind, the goal is normally not the highest yield but the best cost price per kg.

A. Engineering

Insect Engineers can supply your engineering drawings for your new insect farm. Our engineering and advice are based on the latest technologies and include practical know-how as developed in practice.

The goal of engineering is to supply a set of engineering documentation so you, the customer, are able to contact local suppliers for concrete work, electrics, etc.

In the case of an existing building, a local architect and/or contractor must be able to make the insect growing rooms inside the building. For that purpose, we can supply a set of engineering documentation. Based on this information, the local architect/contractor should be able to make you an offer to build your new insect farm in your existing building.





B. Precision Breeding

For a commercial facility with 9 production rooms, we recommend establishing a well thought out breeding set-up. To get proper results you need the right equipment, which you will see below. At same point knowledge is also key. In combination with our Insect School and training on site we can make sure that when you start you work with the latest knowledge available.

The breeding takes places in climate controlled breeding rooms. The climatized buildings can be from special BSF sandwich panels or with our round top structures. In this offer we calculated with the special BSF sandwich panels which are build up in an existing steel structure / warehouse. More info on buildings you can find in section C.1 of this offer.

The breeding part contains:

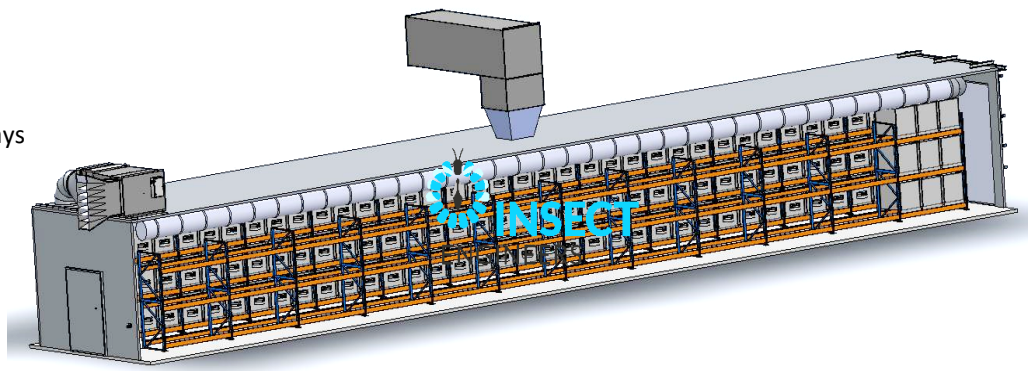
- Growing the adult flies.
- Egg production.
- Breeding till 5-day larvae.
- Breeding from 5-day till stiff pupae.



B.1 Complete Breeding Setup

What is all included in this offer:

- 2 special BSF sandwich panel buildings of each 34m long. Complete with doors and lights.
- 2 climate units. The whole room is climatized, including control system, sensors, air dividing, central controller, online access, software, etc.
- 189 love cages
- Egg collectors
- 1 neonate counter
- 1 tray filler. In breeding it's low volumes in comparison to the production. We promote to keep using trays in this process. To make filling of the trays much easier then by hand we include a tray filler for automatic filling and weighing for these breeding trays.
- 1 tray cleaner
- 1 tray tipper
- Plastic pallets for trays
- Racks for trays
- Trays





Special BSF sandwich panel rooms.

The Insect Engineers love cages are engineered and built with real practical knowledge from our customers, our network and our Insect School.





Cages are made and delivered in sets of 9 pieces. Each cage equals about 0,65m³.

The footprint of 1 set of 9 love cages with the climate ductwork is L x W x H: 287cm x 175cm x 333cm. For your reference, the footprint of 36 love cages is L x W x H: 1122,5cm x 175cm x 333cm.

Each cage contains:

- Fan
- Special light
- Moistening
- Holder for egg collector and attractant.

Each set of 9 contains:

- Ductwork
- Controller

Neonate Counter

If you want to know how your farm and substrate is performing then you need to know with how many larvae you start each cycle. Just weighing gram of eggs is not enough because you don't know the hatching rate. To tackle this we deliver a neonate counter which counts the freshly hatched larvae. Please note we included one, if you want to count all the hatched larvae then you need more pieces.





- Improve breeding programs (test fly densities, lighting, diets, climate, light, etc).
- Monitor your colony and reduce deviations in fertility.
- Doses larvae into specific amounts with similar age in crates.
- Less workload of manual handling in counting larvae.
- Creates higher efficiency in feed conversion.
- Apply precision breeding and save costs.

Remarks: *there are many ways with many different results to calculate the volume of eggs you need. We concluded that the above setup is best to start with. It's no guarantee that it fully fulfills your need of eggs per day. With a simple example, are we going to put 8 or 12 larvae per cm2? Small numbers which make big differences. At least we want to make sure this is mentioned.*

B.1.2 Crate filler



TIP: Movie of this machine can be found on our YouTube channel:

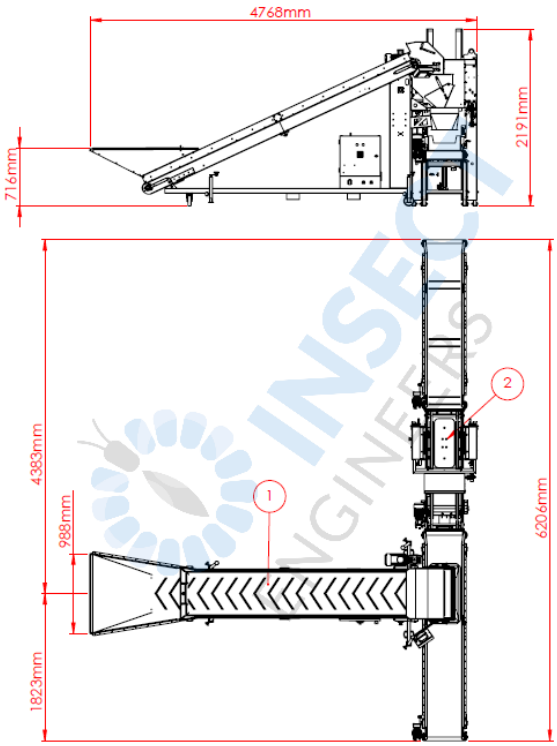
https://youtu.be/9lrpGUUqo94?si=T6psjTxzJDtVKwdw

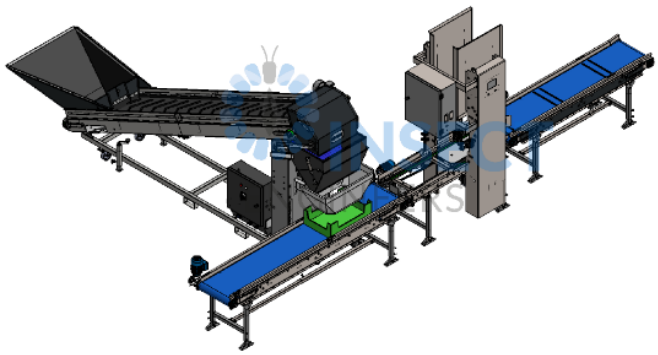
For the crate filler it's a combination of machinery, see the 2 drawings below to make this clear. It includes:

- The supply conveyor with build in weighing unit.
- Destacker for empty crates.
- Buffer conveyor for crates.
- Conveyor which transport the crates in the process of being filled.
- Including control box, etc.
- Automatic stacking of crates is possible but optional and in this offer not included.









B.1.3 Crate tipper



1 unit – The crates are placed on the main belt and are automatically moved upwards. At the top they are guided through a slide where they go upside down and gravity does the work. The empty crates roll back to the entry point.



TIP: Movie of this machine can be found on our YouTube channel:
https://youtu.be/SBpQX8RiUjA?si=YvSCkGELrmC2YpOl

B.1.4 Crate cleaner

1 unit - The crate cleaner takes clear of automatic cleaning of your crates.

B.2 Options on further automation

To make sure customer understands what they are getting we added this page to our offers. Delivery standard includes:

- Panel room
- With climate unit to control the climate conditions (temp, co2, RH,) in the panel room.
- Computer controller on the room to control climate conditions in the panel room.

Love cages are "standard" included with:

- Love cage: we have influence with light, moistening and temperature.
- Air flow in each set of 9 cages is pre-set and can be changed manually because in practice we often don't see any changes in this. If you want automatic then it's optional.
- Washing is with the moistening system, but manually on/off. Automatic is optional.
- Moistening is on a timer.
- Lighting is on a timer.
- Attractant boxes in the "mailbox" of the love cage. Manually placed.
- Works with recirculation air. Air output is in the room. When you want to dampen the smell then output air can be centralized in leaving the room. Centralized output of the air is optional.
    - Note: recirculation air is very cheap. Once temperature is in the room you have very low energy cost when using recirculation air.

Following options we can offer:

- Central location for the attractant, have air tubes to each love cage. Saving is on labour changing the attractant. It will be connected with the controls of the light. In other words light on means attractant on and vice versa. Creating the smell and/or making a gas that is up to the knowledge and responsibility of the customer.
- Different stages of flies have different requirements. Day 1 fly has different requirements then the day 5 fly. Mainly because of lightning requirements. Do note that even an emergency light has effect in a dark room. There are two solutions. First one we recommend at current stage:
    1. Make sections (seven?) in the room with PVC materials. Want to cover / protect cages for external light. *(mentioned in price overview)*
    2. Making multiple small rooms. Note when you go bigger then this "challenge" goes away as you will have multiple breeding rooms and each room can contain its own stage. *(not offered)*
- Humidity and temperature monitoring of each section of 9 love cages. That means one of each nine cages you monitor as reference for the set of 9.
- Lighting of each section of 9 love cages. This can be controlled with the controller of the panel room, it's a software option.
- Moistening / cleaning of each section of 9 love cages. This can be controlled with the controller of the panel room, it's a software option.

C. Production

C.1 Special BSF Sandwich Panels

To reach the optimal production result, it is important to work with special designed growing rooms. On the one hand, these panels are easy to build by a local workforce. At the same time, the building meets the high insulation requirements for an optimal insect farming result.

Your facility contains 9 rooms with outside dimensions of each room (length x width x height) ± 34,00m x 5,96m x 4,03m. Each of these rooms which will be equipped with climate controls and are suitable for growing black soldier flies.

These panels have an **unique coating** specially developed with Insect Engineers specific for the use of black soldier fly farming.





Each room is delivered including one professional insulated sliding door like shown on these 2 pictures.

The filling/emptying area side of the room contains a bigger door. See also next page.

The footprint of 1 set of 9 rooms excluding surround concrete floor to enter and the filling/emptying area is 54x34m (1836m² / 19760 sq ft).

Besides the panels the delivery also includes:

- Adhesive tape aluminum/bitumen
- Silicone
- Polybutene sealant
- Self-drilling screw, cylindrical head, cross recess
- Nail plugs
- U-profile
- Inside corners
- Outside corners
- Flat profile



On one side you have the staff entry door like shown on the previous page. On the other side of the room there is the so called filling/emptying area. Meaning the floor space where you fill or multiple-feed the substrate in the rooms. And after the growing cycle where you harvest/empty the rooms. Each room is equipped with 2 swing doors, like shown below.





D. Supplies

Receiving value for money… that is our main focus when it comes to supplies. We make no concessions when it comes to quality, because we want to supply our customers with products that have a long lifespan and support your business in a positive functional way.

We will always look at your specific situation to generate optimized efficiency and easy implementation of our products into your business. This means that we can customize our supplies specifically to your business.

A critical process is completed before we decide to add a product to our product line. This means that all products have been tested thoroughly on functionality, safety and user friendliness.

D.1 ZOEM racks

You will receive vertical ZOEM racks for your BSF project.

Below, you will find specifications, advantages and some pictures of the aluminum ZOEM racks:

Total number of rooms	:	9 rooms
Total number of rows	:	2 rows / room
Length of the row	:	30.0 m
Width of the row	:	1.50 m outside posts.
Height of the row	:	7 levels





Advantages:

- Easy to assemble
- Quality welding
- Transport-friendly.
- Aluminum is maintenance-free, light material, easy to clean and it has a high trading value.









D.2 ZOEM flex floors

The special bottom / pulling ZOEM flex floor is used to pull your raw materials into the ZOEM racks while laying on this ZOEM flex floor. Besides easy filling, it also enables easy emptying.

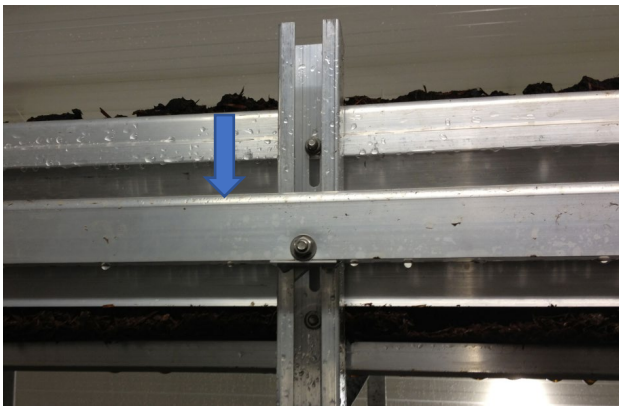
Required: 14 per room, for 9 rooms this make 126 units + 6 spare ZOEM flex floors.

These ZOEM flex floors last for many years.

D.3 Rail and Platform

The ZOEM racks are installed with an additional rail. This rail enables hanging a platform suitable for a person to step on. This platform can take your staff member to the different height levels of the ZOEM racks to work or do their inspections.

We will deliver 60m top rail and 60m bottom rail per room. It will be installed in between the 2 rows. Including 2 electric platforms per 9 rooms.





E. Machinery

Insect Engineers has been providing new machinery for many years.

We develop standardized machinery, but we also customize machinery specifically to your business for optimized efficiency and easy implementation of our products into your business.

What does a customer look for in a machine? This is the main question the engineering department asks itself when developing machinery. All materials used for the machine have a function and are essential for operation of the machine. This improves the reliability of our machinery because there is less chance of equipment breaking down when less equipment is used.

The simple and easy-to-understand structure of the machine is key and comes with many advantages such as, but not limited to:

- A higher grade of safety, because the operator has a clear view of what is going on around the machine.
- Working comfort of the machine, which limits the chance of mistakes being made.
- Easy and efficient cleaning of the machine.

Cleaning is the main cause for problems with machinery. This is what we found out when we analyzed the service requests of the last few years. Therefore, we have covered almost all bearings and the electrical box to prevent damage while cleaning the machine.

The machinery undergoes extensive risk analyses and potential hazards are taken care of. This is done in line with CE marking and the extra high Dutch standards. We are extremely critical when it comes to safety.

The chosen materials used to preserve an Insect Engineers machine are stainless steel, hot-dipped galvanized steel, steel which is protected by the high-pressure hot zinc spraying method (flame sinking) or steel parts which are protected by paint, to ensure a long lifespan.
Most parts are sand blasted first before 2K paint is applied to ensure the best adhesion.

Use of parts available worldwide. If for some reason, you need to change a part quickly, getting something locally is always the preferred option.

A straight floor is required to operate the machinery.

E.1 BSF ZOEM Filler - Premium



1 unit - The BSF ZOEM Filler is used for filling the vertical ZOEM racks (D.1). A ZOEM filler makes it possible to fill your raw material into your shelves. In addition to multiple feed afterwards, a special rack with wagon and ZOEM flex floor is added. The BSF ZOEM filler works in combination with one ZOEM Puller and one feeding Conveyor.





Further details:

- Self-lifting construction. This way, the filling platform always sits in a horizontal straight line with the shelf.
- ZOEM Filler unloads directly from the belt on the shelf.
- Filling from machine directly on the growing ZOEM flex floor.
- Variable filling speed.
- Including multiple-feed unit. At any give moment during your production cycle you can add another layer of feed on the existing layer of substrate and larvae.
- Including automatic dosing of 5-DOL.









E.2 ZOEM Puller 1-Arm



1 unit – The ZOEM Puller is used for pulling in the growing ZOEM flex floors (D.2) into the vertical ZOEM racks (filling) or pulling the growing ZOEM flex floors out of the vertical ZOEM racks (emptying). It is a self-lifting construction which means you can place the arm to the different heights of the several beds.
The ZOEM Puller is used in combination with a ZOEM Filler (filling) or Emptying Conveyor (emptying). The functioning of the ZOEM Puller during filling can be checked using the ZOEM Filler after connecting them to each other. The ZOEM Puller and BSF ZOEM Filler have the same speed, which ensures an even growing surface.



E.3 ZOEM Supply Conveyor



1 unit - The ZOEM supply conveyor is used for supplying raw material towards the ZOEM Filler (E.1). The Conveyor automatically moves up and down with the ZOEM Filler. The conveyor is controlled by the remote control of the ZOEM Filler and will respond with start/stop on the height sensor of the ZOEM Filler.

Further details:

- ✓ ± 10.5 m-long conveyor
- ✓ Driven by a drum motor

E.4 ZOEM Hopper

The hopper is used for storing large quantities of substrate. Also, this hopper will ensure a continuous and even supply of material.

By generating a perfect flow, this hopper is an indispensable asset for precision bulk supply.

This hopper is multi usable but stands out for its use for the material towards the BSF ZOEM Filler, via an intermediate conveyor (E.3).

Thanks to the extremely solid structure of this hopper, loading can be done with, for instance, a bobcat or shovel.

For easy movability, the hopper is placed on four swivel wheels, two of which have brakes to ensure the hopper stays in place. Thanks to weight distribution, the hopper is easy to handle and extremely stable. The chosen design allows easy accessibility and minimum maintenance time.

The hopper can be connected to, for instance, the BSF ZOEM Filler by a controlled cable, and will work in harmony with such other machines.





Option: Dosing wagon:





E.5 ZOEM Emptying Machine

1 unit - The ZOEM Emptying Machine is used for transporting the ready-to-empty growing surface (substrate + larvae) into a Trailer or similar during emptying of the production rooms. The ZOEM emptying machine is placed against the ZOEM racks and pulls the ZOEM flex floors out of the ZOEM Racks. The frass and larvae fall on the main Emptying Conveyor. Then it moves up in height and can unload directly in a trailer, wagon or similar. Like the optional item at section E.4.

In a pilot scale you would work with a loose emptying conveyor and the ZOEM puller. By using this machine you only need 1 person to do the job and you increase your efficiency.



The machine is build up by the following main parts:

- Emptying ZOEM flex floor puller, 7 arms!
- Emptying conveyor.
- Hydraulic driven under frame.

E.6. ZOEM flex floor washer



The growing ZOEM flex floor cleaning machine is designed to clean the ZOEM flex floors that are used in ZOEM racks.

The big advantage of using an Insect Engineers ZOEM flex floor cleaning machine is that the ZOEM flex floor is be winded on a rod inside the machine. This working method will make sure that the ZOEM flex floor will not touch the floor after it is being properly washed. The benefit is that the ZOEM flex floor stays clean after washing.

Cleaning a ZOEM flex floor on a floor with a regular high pressure cleaning machine without using an Insect Engineers ZOEM flex floor cleaning machine, is much more work with less result.

Also disposal of waste which is inside and on the ZOEM flex floor will be done much better when high pressure sprayers are used in combination with holding a ZOEM flex floor vertically during washing. The shape inside the cleaning machine is like to funnel.

At the bottom at the middle of the washer the disposal water will leave the machine.

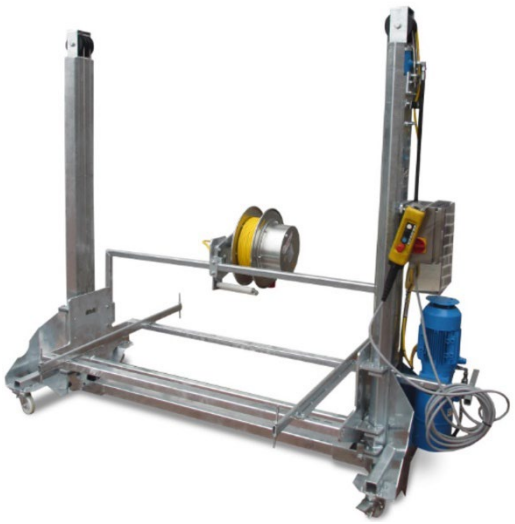
E.7 ZOEM mixer

By practice people have experienced that it would be nice to enable mixing up your substrate (and larvae) during the 9 day production cycle.

We have built a machine for that which can drive in the ZOEM racks and automatically mix the substrate in the ZOEM rack. Including wireless remote control.



Movie can be found here: https://www.youtube.com/watch?v=0k4rnDPqNi0



→ Lift to get the ZOEM mixer on different heights and supplying power when driving in the ZOEM rack.

E.8 ZOEM washer (optional)

Instead of a person with a high pressure washer you can use a ZOEM washer which automatically drives into your ZOEM racks and cleans the aluminium. Same principle of operation as the ZOEM mixer. Including wireless remote control.





F. Climate-controlled environment.

Climate control systems and well-insulated growing rooms are main aspects within your growing environment and will determine the quality conditions of your insect farming.

We have been developing prefabricated, easy-to-install and energy-efficient air-handling units, air distribution systems and user-friendly climate computers for many years now.

Entirety is one of the main benefits of our climate control systems. You can rest assured that the proposal is complete, and that the climate control is optimized to suit your local situation, which we analyze thoroughly.

We also take away the hassle of the installation of your climate control systems. We deliver assembly-ready climate systems so all you have to do is connect the pipes. This enables growers to get right back to business.

The climate system is maintenance friendly. Inspection hatches, specific filters and transparent or open siphons are implemented to assist this. This also prevents problems because they can be identified easier and faster.

We only leave when we are 100% satisfied and all the details are right to ensure the best growing conditions for your insects.



F.1 Controllers

The following set points are examples of what can be controlled:

- Substrate temperature
- Room temperature
- Ammonia level
- CO2
- Humidity
- Etc.

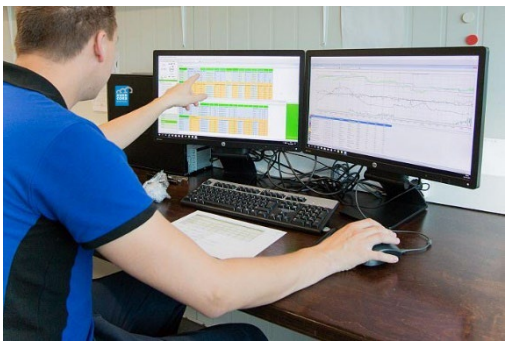


The central computer will initially contain our standard set parameters wherefrom you could start. At the same time, you can change the set point of, for example, room temperature. You can also change the range up and down in the event room temperature fluctuations are permitted.

These sensors and an outside weather station are included in the delivery.

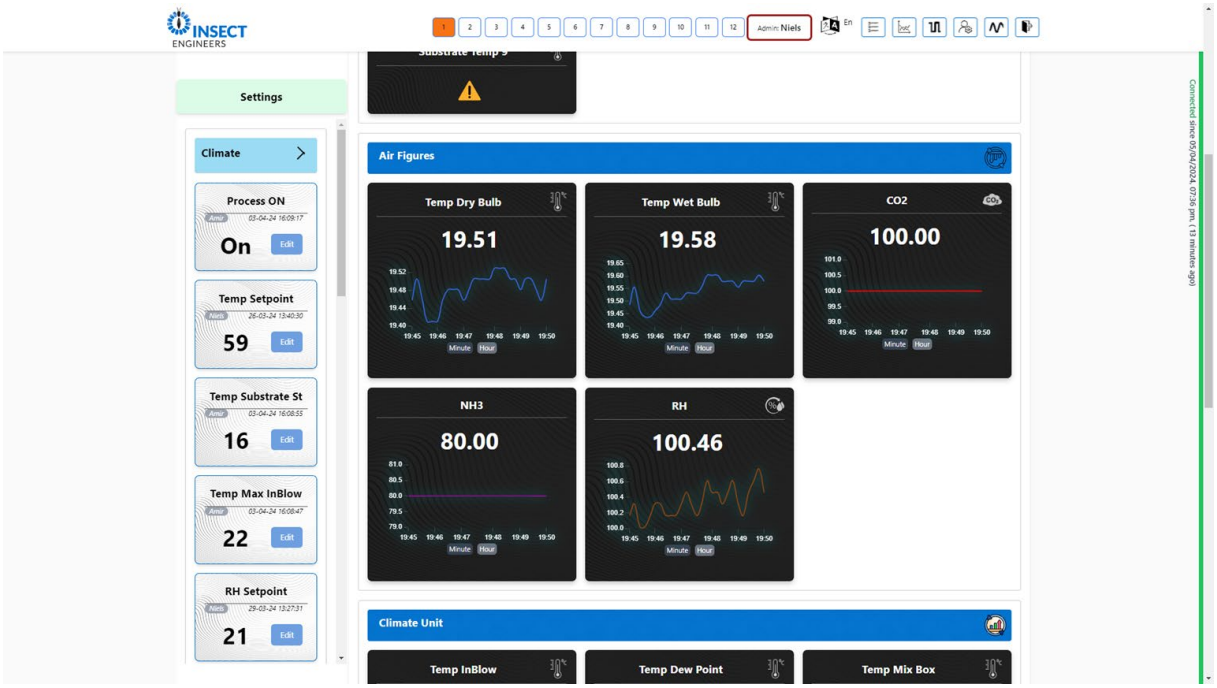
Computer control:

You can access your automated production rooms from any device such as your phone, tablet, laptop and desktop.

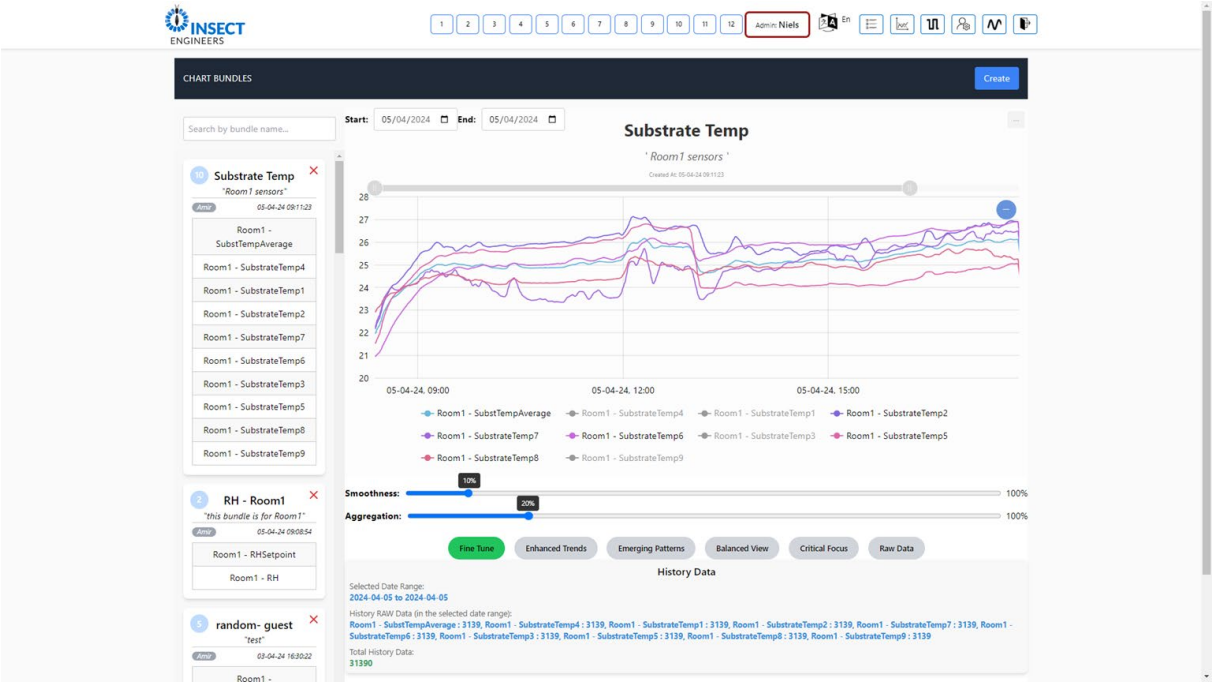


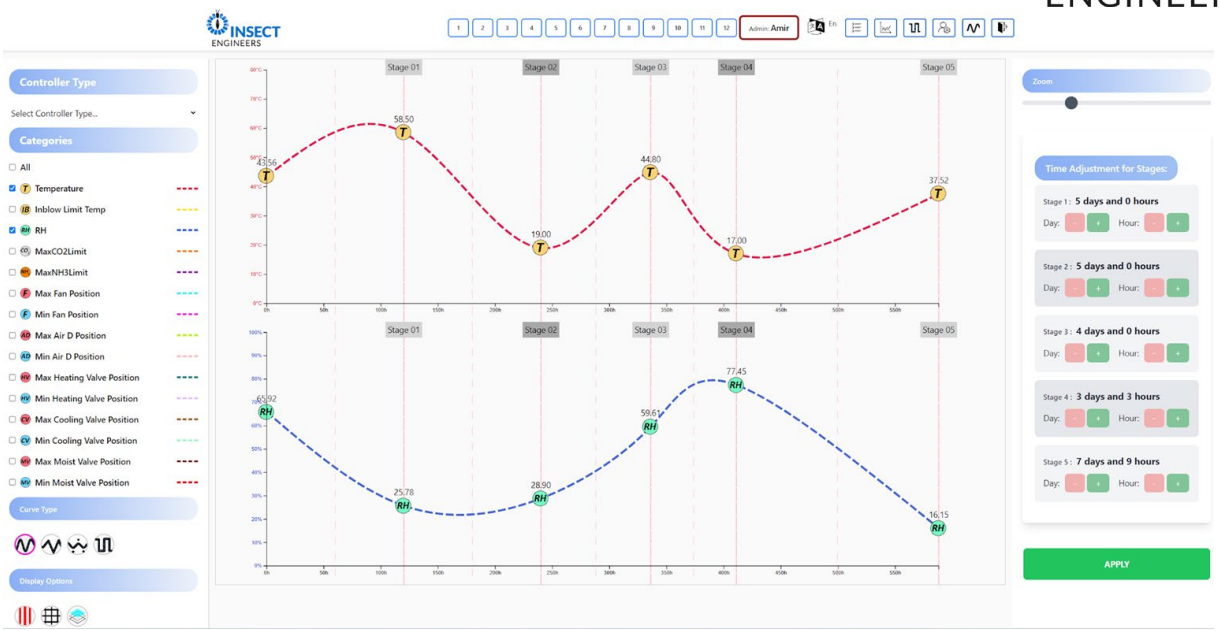
The insect growing process is totally under control 24/7 and for all the different stages. Stages in which the BSF needs to grow to give you the highest possible quality and quantity. In the system, the climate unit and air distribution system must be calculated in line with the needs of the BSF to grow with the highest possible quality and quantity for the sizes of your farm. The Insect Engineers controller must also fit into the farm design.

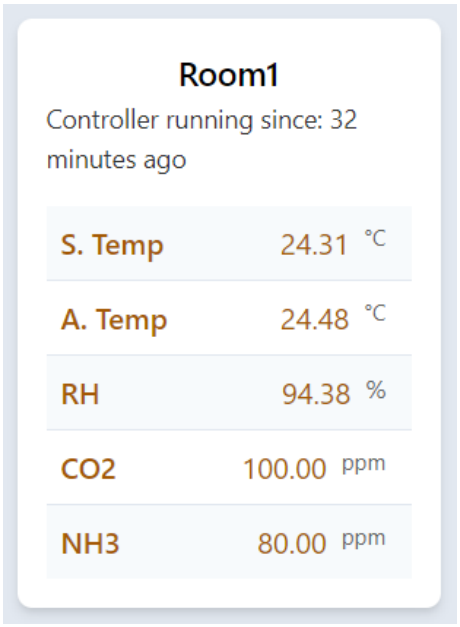
Screenshots:




Substrate
Subst Temp Average
24.02
Substrate Temp 1
Substrate Temp 2
24.61
Substrate Temp 3
Substrate Temp 4
Substrate Temp 5
24.09
Substrate Temp 6
23.04
Substrate Temp 7
24.39
Substrate Temp 8
23.96
08:4108:42
08:43
08:44
08:45
08:46
Minute
Hour


INSECT ENGINEERS
CHART BUNDLES
Create
Substrate Temp
'Room1 sensors'
Start: 05/04/2024
End: 05/04/2024
Admin: Niels
Smoothness:
Aggregation:
Fine Tune
Enhanced Trends
Emerging Patterns
Balanced View
Critical Focus
Raw Data
History Data
RH - Room1
random- guest


Controller Type
Select Controller Type...
Categories
All
Temperature
Inblow Limit Temp
RH
MaxCO2Limit
MaxNH3Limit
Max Fan Position
Min Fan Position
Max Air D Position
Min Air D Position
Max Heating Valve Position
Min Heating Valve Position
Max Cooling Valve Position
Min Cooling Valve Position
Max Moist Valve Position
Min Moist Valve Position
Curve Type
Display Options
Stage 01
Stage 02
Stage 03
Stage 04
Stage 05
43.56
58.50
19.00
44.80
17.00
37.52
65.92
25.78
28.90
59.61
77.45
16.15
Zoom
Time Adjustment for Stages:
Stage 1 : 5 days and 0 hours
Stage 2 : 5 days and 0 hours
Stage 3 : 4 days and 0 hours
Stage 4 : 3 days and 3 hours
Stage 5 : 7 days and 9 hours
Day:
Hour:
APPLY


Room1
Controller running since: 32 minutes ago
S. Temp 24.31 °C
A. Temp 24.48 °C
RH 94.38 %
CO2 100.00 ppm
NH3 80.00 ppm

F.2 Climate Unit

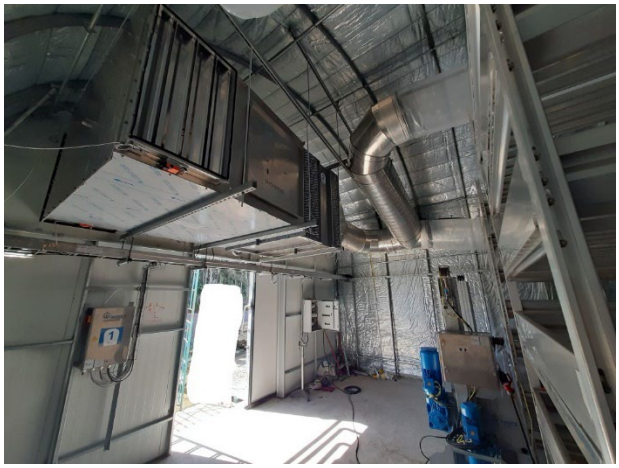
The climate unit is the hardware in and outside the growing room. The climate unit is controlled by the controller (F.1). The climate units are prefabricated and easy to install.





Each unit consists of:

- Fan
- Heating coil
- Cooling coil
- Fresh air damper
- Return air damper
- Servo motors



The unit itself is connected to a combination of aluminum and plastic air ducts to reach an optimal air distribution in the room and the ZOEM racks.



F.3 Automatic Watering

The ZOEM racks can be equipped with water bars under each layer. All these bars will be connected to a central water pipe. The controls of the automatic watering will be integrated in the climate software and the controller (F.1). Meaning with one press on the bottom the whole production room can be watered at once. For example 5 minutes for the whole room. All 9 rooms can be equipped with this automatic watering system. From the past the idea was to not add water because that would give issues later on with processing. But at same time it is noted that you can make dried substrate wet again and mix it (E.7) to get a higher conversion. In addition giving water can be a good alternative for cooling which saves energy cost.

F.4 Central chiller + central heater

We can deliver the central chiller and central heater. The chiller capacity is set on … kw *(Has to be calculated based on your local conditions)*. The heater capacity is set on … kw *(Has to be calculated based on your local conditions)*. Please note that for energy consumption this also depends on a factor simultaneously. When one rooms requires 100kw then it's not that two rooms need 200kw.



For the chiller we normally work with York. This is a well-known worldwide based company which can service there chillers all around the world. Installation of the York specialist is included in the price.

F.5 Bio-Bed

We will deliver a bio-bed to reduce ammonia and smell coming out of your growing rooms.







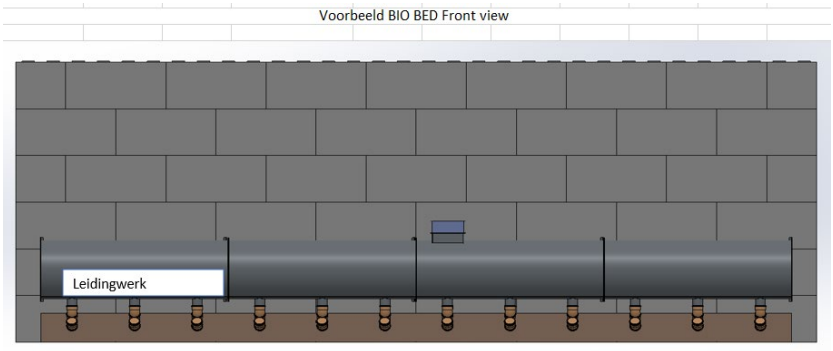
What we deliver:

- Aerated area of 6x18 meter internal size. For your view we can push about 100.000m3/hour air through this.
- Central channel
- Fans, etc.
- All plates, pipes, connections, elbows, etc.
- Pipes for in the concrete
- Control system measuring NH3, moist content and temperature.
- Including pressure sensors in the central duct.

- Including moistening system.
- The first badge of living organisms
- 10 pieces of concrete molds to enable producing this concrete blocks locally. Delivering molds is cheaper than when putting it all on transport because you're transporting a lot of weight.

Customer takes care of the following:

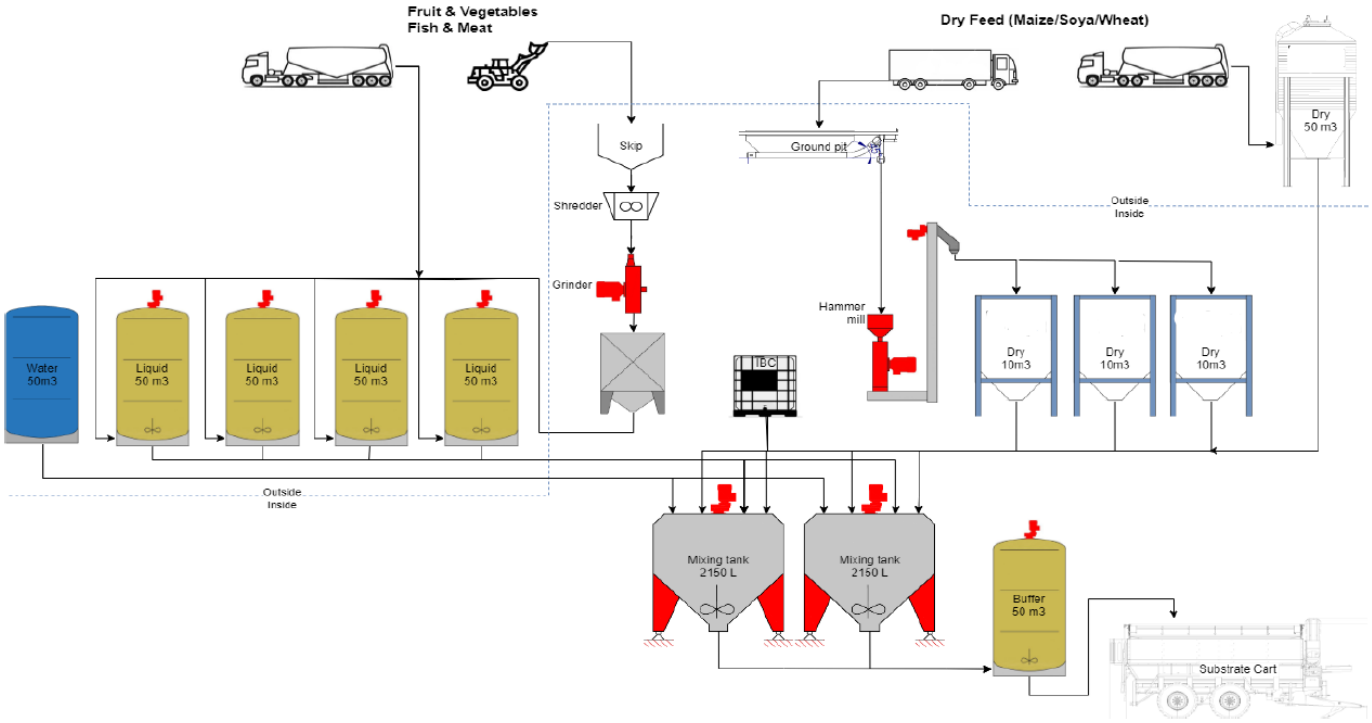
- Wood chips, root wood, tree truck chips
- Concrete



Please note: when you have really hot summer conditions with over 50 degrees Celsius for a longer period then the micro-bacteria of a biobed would probably also not survive. So then you need the direction of an air washer.

G. Substrate preparation (30-70 tons per day)

To enable using the raw materials as a feed for the BSF, preparation is needed. This setup can be different per customer as each customer can have their own selection of raw materials. In this offer we have tried to make a first setup which we believe from all our experience will be closest to what a BSF farmer would be getting. At same time by doing this you are getting a complete overview of the investment. In all cases in a later stage together we can look what raw materials you use, how they arrive on site, how often they arrive, if it will be liquid or not, etc.



G.1 Silo with Flexauger system

The system consists of a silo (diameter 3.50Pm(49,5 ton) per house suitable for mechanic and pneumatic filling, made of high quality galvanised steel. The silo is including a ladder and roof ladder, safety cage, in-hook ladder, entry hatch, spy glass and a set-up kit. There will be a Flex125 system transporting the feed. Complete with drive unit, sensor, motor switch and suspension materials.

Silo:

- 1 unit
- Diameter 3,50m, 7 rings, 73.8 m3, 49,5 tons, h=10.68m pneu + mech filling.
  Incl. ladder, roof ladder, safety cage and 2x inspection window.



Flex auger system:

- 1 unit
- Flex 125, from silo to Mix Tanks, 10 meter, 4600 kg/h.







G.2 Dry feed reception, milling and storage

Coarse grain dry feed components are received in a ground pit, directly from the Bulk Truck. A chain conveyor transports the feed from underneath the ground pit. The feed needs to be grinded as a preparation for the ideal mixing procedure. This will be done with a hammermill solution. To make sure the mixing system will operate at its maximum speed, buffers for grinded product are foreseen for each feed type.

1x Intake Pit 8,0 x 3,0 m + Grid

1x TPK Goose-necked intake pit chain conveyor 45 degrees (two floor) – do 80 t/hL= 10,0m

2x Hammermill, motor 22kW

1x Jef filter Duo. Self-cleaning – Product cooling – Dust extracting

1x Trough auger to elevator

1x Chain elevator. 6,2m. 3kW

1x Tube auger to fil flex silos, galv., 15 meter, 2 Pneum / 1 Mech outlets

3x Flex Feed Hopper, Dimension 2100 x 2100 x 3300mm, Volume: 10 m3

1x Connection materials and flanges

3x Flex 125, from flex silo to mixer, 10 meter, 4600 kg/h



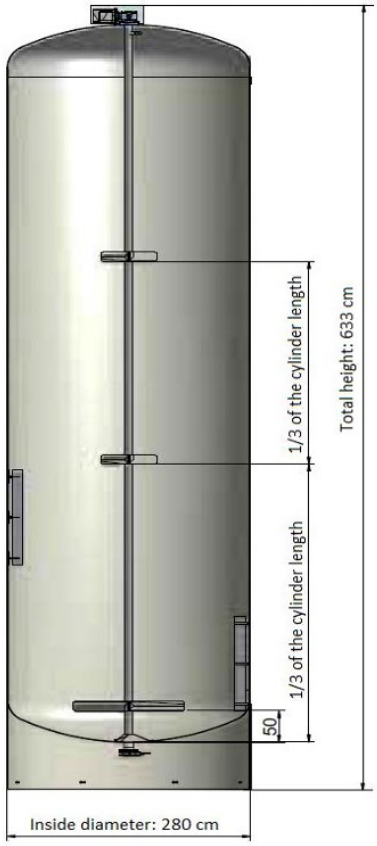
** excluded are platforms and frame constructions to which the modules need to get mounted

G.3 Liquid Feed Reception and Storage

For storing wet by-products special silos are required. These composite silos are selected to store pumpable wet by-products up to 75°C with a density up to 1300 kg/m3.

4x Silo for wet by-products 50m3, with agitator

1x Silo for wet by-products 50m3, with agitator



G.4 Liquid Feed Grinding

Organic waste stream will arrive in a prepared way to the plant and can be stored in special silos straight from the truck. From the silos the product can be used for mixing. In case the right particle size needs to be secured, the product can run through a grinder. The set up of this systems secures an efficient infeed of feed to the mixing department, the right particle size and efficient deliveries from the trucks.

1x Inline grinding solution, 55kW, Stainless Steel
1x Support frame
1x Tank 500 liter
1x Pump 4kW
0x Noise reduction cover (now excluded)
1x Liquid components removal and grinding
1x Liquid components filling mix tanks



G.5 Liquid Feed Mixing Tanks

The feed kitchen is designed in such a way that feed deliveries to the mixing tanks are fast. Due to the tank design, mixing is done efficient in smaller-type batches. This batch-size results in easier homogenic mixing, better temperature control and an easier to clean system.

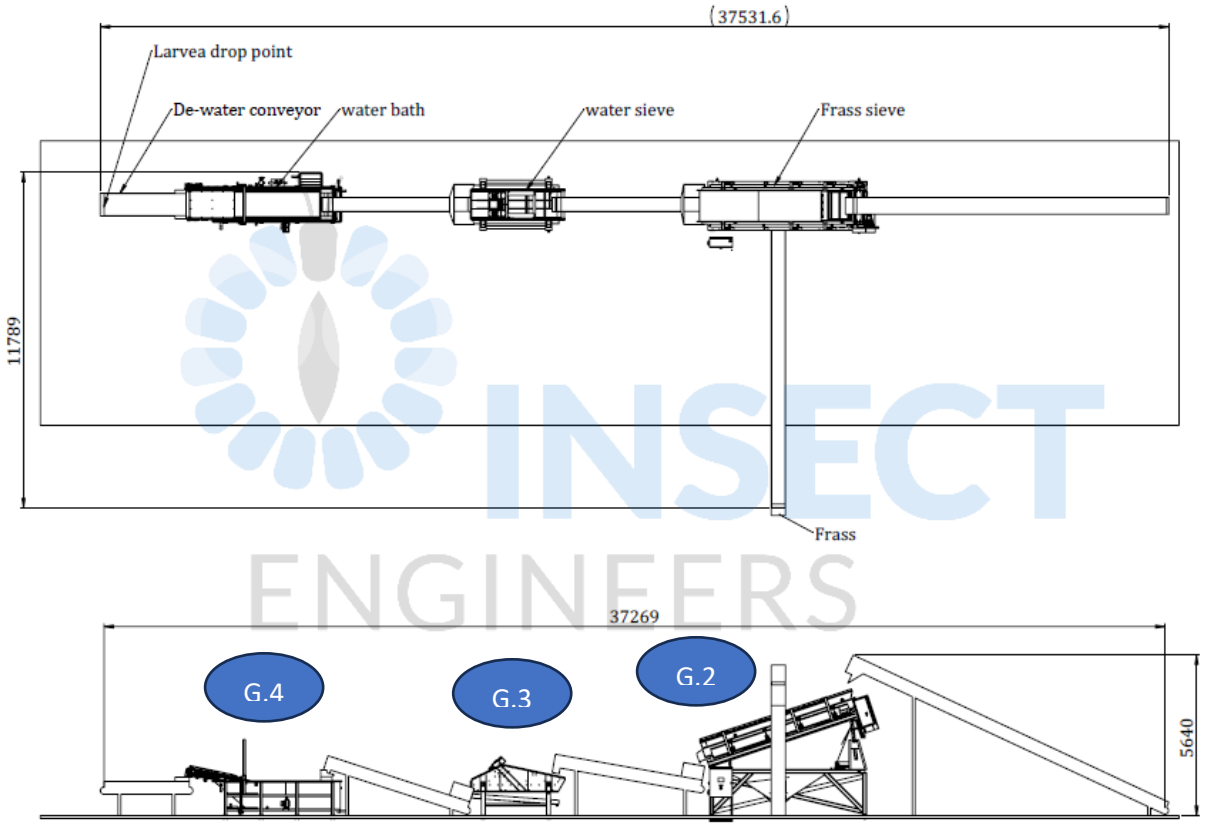
1x Feed kitchen Rearing/Fattening
1x Water storage
1x Cleaning system turbo
1x Compressed air blow out

G.6 Control Systems

1x Control system Rearing/Fattening
1x Control system milling
1x Control liquid components

H. Sieving

H.1 Multi Step Sieving







H.2 Frass Sieve



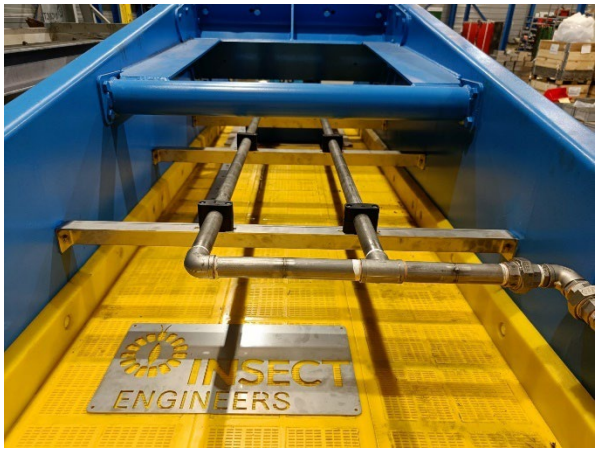


Sieving starts at the highest point. The inlet is on top and the materials will fall down. The 'belt' will move up and down. Not shown on the picture but the top of the sieve in the whole length will be closed when being in operation.

Capacity: maximum about 7 ton per hour. Capacity can vary because of substrate.

H.3 Water Sieve





The larvae and remaining larvae will end up in this water sieve. It's high vibrating and uses water to get the substrate out through the open bottom, the larvae continue forward.

Capacity: maximum about 10 ton per hour. Capacity can vary because of substrate. So in practicality you can connect two or even three frass sieves to one water sieve.

H.4 Water bath







Conveyor in a bath of water. Water can be pumped around and be sieved. Final cleaning of the larvae. Water can also be heated up so you get boiling water to kill the larvae. Most likely when you want to kill the larvae and look at regulations you need two of these, standard we use one. Because when producing for pet food you only use water and not boiled water before it's being processed.

Please note: a water cleaning installation to keep re-using the water is not included, but recommended to arrange this locally.

H.5 Dewater conveyor



Conveyor belt with small holes to promote water loss from the larvae.

Optionally you can blow air through from underneath. Fans are standard not included.

Another overview picture:





H.6 Supply Wagon

At emptying of the ZOEM racks the frass + larvae are unloaded in this wagon. Can be the same as the optional dosing wagon at section E.4.





I. Processing (optional, to be discussed)

I.1 General Drying

Calculated with a capacity of 9.000 kg wet larvae per 12 hours.

Engineering : detailed & customized engineering for execution.

Automation : incl. switchbox, PLC, touch-panel & software.

I.2 Drying

Drying line is including:

- Product buffer and feeding conveyor with buffer for feeding of the living insects towards dryer.
- Dryer with disk dryer including fan and cyclone.
- Discharge conveyor, 1 discharge screw for feeding the dry insect towards pressing line.





I.3 Pressing

- Heating and feeding towards press.
- Separation of metal parts.
- The press itself to separate solids and fat including temperature control.

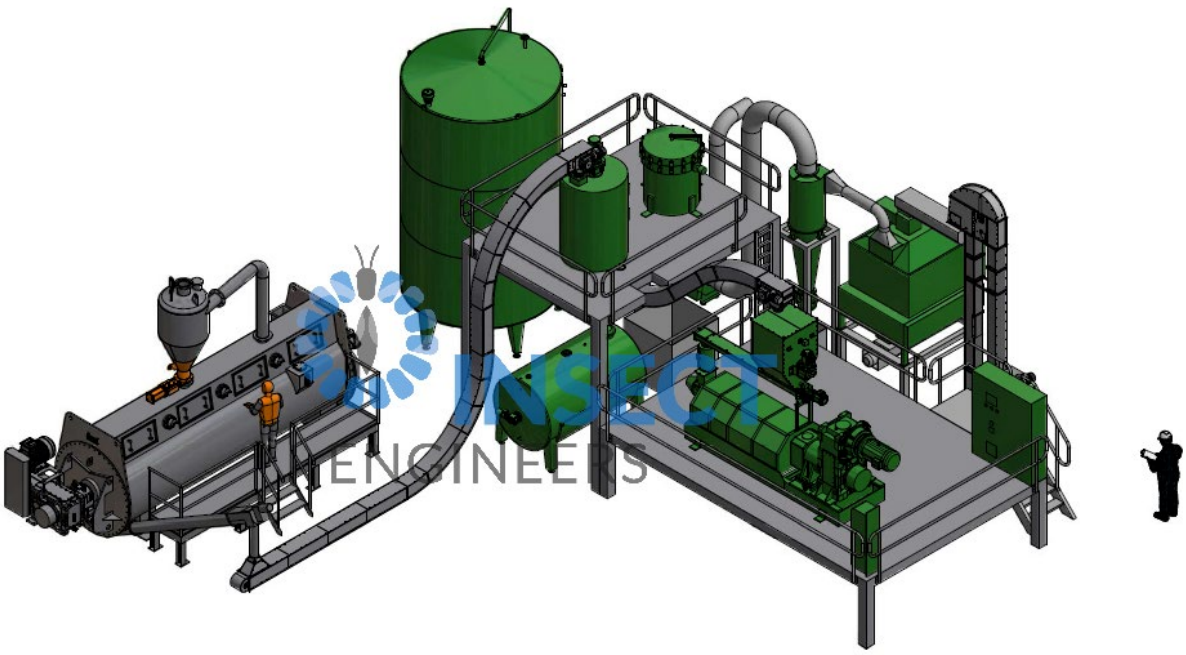
I.4 Mealing and Grinding

- Mill, to grind the insect cake to meal (<1mm).
- Additional cooling and expansion bin.
- Distribution screw.
- Big bag loading including weighing stations.

I.5 Fat filtration

- Storage of crude fat including stirrer.
- Fat filter chamber to press the insect fat.
- Screw pump (heatable excentric)

Above including sensors, electronics and storage tanks.



J. Frass

Introduction

Drying insect frass offers several advantages, particularly when used as an organic fertilizer:

- **Sanitization**: Drying at high temperatures (around 70°C) ensures that the frass is sanitized, eliminating harmful pathogens and making it safe for agricultural use.
- **Nutrient Preservation**: The drying process helps preserve the nutrients within the frass, such as nitrogen, phosphorus, and potassium, which are essential for plant growth.
- **Improved Storage and Handling**: Dried frass is easier to store and handle compared to its wet counterpart. It reduces the risk of mold and other storage-related issues.
- **Enhanced Soil Health**: Dried frass contributes beneficial microorganisms and biomolecules to the soil, promoting plant growth and improving soil health.
- **Sustainability**: Using dried insect frass as a fertilizer supports sustainable agriculture by reducing reliance on chemical fertilizers and promoting the recycling of organic waste.

Would you like to know more about insect frass? Read also the factsheet of IPIFF, click here: (https://ipiff.org/wp-content/uploads/2021/11/Nov-29-2021-IPIFF-fact-sheet-on-insect-frass-final.pdf).

How does it work?

How can you dry and/or pasteurize frass in an efficient and economical way? This can be done by combining technology with the natural benefits of composting.

The Insect Engineers frass drying tunnel works with the following steps:

1. With pipes in the ground air will be blown through the frass.
2. The air will bring oxygen in the frass and this will start an composting reaction in the frass.
3. Temperature will raise to 60 to 75 degrees Celsius.
4. Because the temperature raises more water will be evaporated.
5. The frass dries.

J.1 Frass drying tunnel - engineering

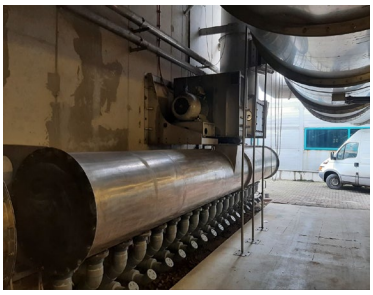
Our engineering and advice are based on the latest technologies and is including practical know-how as developed in praxis. The goal of the engineering is to supply a set of engineering documentation so you as a customer are able to contact a local architect and/or contractor. Based on this information the local architect/contractor should be able to make you an offer to build your local structure. As the tunnel is made from concrete, that is not something you import so this always be local work.

The following items are included in this engineering:

- Complete lay out of the 2 bunkers with ground plan.
- Width, length and height of the building.
- Flooring and drainage system.
- Concrete flooring plan.
- The proposed air distribution will be drawn in.
- Showing incoming and outgoing air duct.
- Including drawing of the climate unit hanging or standing.
- Including positioning of the lights.
- Door sizes.
- KW of the climate units, computer controller and machinery including proposed amperes and position of the plug connections in the new building.
- Advised water connection.







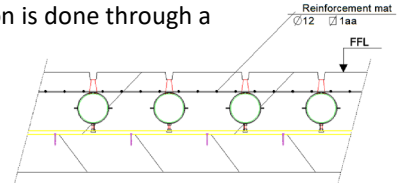
J.2 Frass drying tunnel - floor

The following dimensions have been set. As this is a modular system this can be altered on customer specific wishes. But the below is where we based our price offer on.

- Width 5m
- Length 24m
- Filling height 2-3m
- Input capacity per complete drying cycle 350m³ (max)
- Number of tunnels 2

The time frass needs in a drying tunnel depends on different factors. The moist content of the frass itself, volume, weather, etc. A drying cycle will be between 2 and 4 weeks. In all cases drying is always possible as we standard offer 2 tunnels when having 9 or 18 production rooms.

Each tunnel will be fitted with an individual air control systems, located at the rear of the bunker in a central corridor or on the roof top, that is part of the drying building. The required fresh air will be taken from this corridor for which the corridor has enough screened air openings. The main air distribution is done through a special floor system consisting of PVC pipes and nozzles.

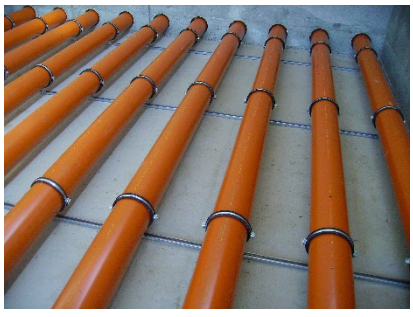


Each frass drying tunnel contains:

- 1x Centrifugal fan
- Hot dipped galvanized housing and impeller, direct drive fan motor.
    - Frequency controlled.
    - Flexible connections pressure side. Protection grid on suction side.
- 1x Main manifold duct, including connection to main fan and pipe connections into tunnel floor. Main manifold connects to individual pipes by Y piece and provides individual access for cleaning the pipes.
- All pipes are pre-drilled, spigots to be mounted at construction site.
- Central manifold, at the filling side of the tunnel with cleaning access.







J.3 Frass drying tunnel - Climate

Air control systems are the main aspect within your drying process and will determine the quality conditions of the out coming frass.

We have been developing prefabricated, easy-to-install and energy-efficient air-handling units, air distribution systems and user-friendly climate computers for many years now.

Entirety is one of the main benefits of our climate control systems. You can rest assured that the proposal is complete, and that the climate control is optimized to suit your local situation, which we analyse thoroughly.

We also take away the hassle of the installation of your climate control systems. We deliver assembly-ready climate systems so all you have to do is connect the pipes. This enables farmers to get right back to business.

The climate system is maintenance friendly including inspection hatches. This also prevents problems because they can be identified easier and faster.

We only leave when we are 100% satisfied and all the details are right to ensure the best drying conditions for your frass.

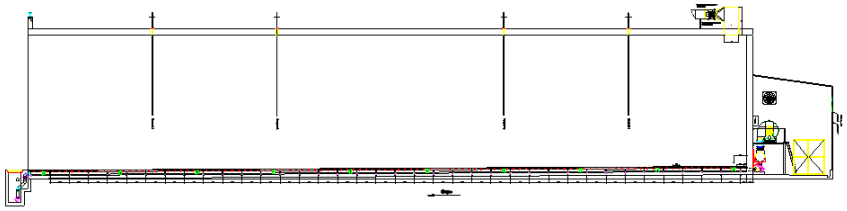


Besides the air control unit we also supply the related controls and software. The Insect Engineers control system uses the latest technology and proven software to control all stages of the drying process. And this can all be done from 1 computer or through the app.

Process computer specification

The Insect Engineers control system based on the use a pulse / pause modulation set, and comes with programmable stages. Per tunnel 2 frass probes will be installed.

(*) Each frass probe will be placed via the roof, the stainless steel rod will be approx. 4 meter long.



The computer will initially contain our standard set parameters wherefrom you could start. At the same time, you can change the set point of, for example, frass temperature. You can also change the range up and down in the event temperature fluctuations are permitted.

Including 2 frequency controllers.

PLEASE NOTE: If you need an 100% guarantee that the frass will reach to 70 degrees Celsius for at least 1 hour, then you should consider adding a steam boiler. Purely for drying purposes this is not needed, as enough heat will be generated. But the warranty of getting 70 degrees is only with a steam boiler. Our advice would be start without and can consider this later when required.

J.4 Frass drying tunnel - Machinery

It's best to have the frass divided with a conveyor hanging in the top of the building. When you want to use our frass drying tunnel on smaller scale *(like 1 or 4 production rooms)* you can postpone the investment for a conveyor system and use a loader instead.

A main conveyor with storage hopper can unload on the hanging building conveyor. Or you can use our transport/dosing wagons as replacement of the hopper.

1 set consists of:



- Hopper *(standard not included, not needed when transport/dosing wagons are already included).*
    - Capacity: +- 9m3
    - The length of the bin is 4,3 m.
    - The width of the bin is 3,5m at the bottom and 1,9m at the top.
    - With stainless steel bottom plate.
    - Including a hot dip galvanized kick back and levelling drum.
    - Usage: The frass is tipped into this hopper. The hopper takes care of the material flow towards the feeding conveyor.



- Feeding conveyor towards the top filling conveyor.
    - 14m long in an angle of 22 degrees
    - 500mm belt width
    - Trough conveyor type
    - Construction is galvanized
    - Speed: 1m/sec; 40m3 / hour.
    - Unloads on the main conveyor.



- Main conveyor in top of building.
    - 22m long
    - 500mm belt width
    - Trough conveyor type
    - Construction is galvanized
    - Speed: 1m/sec; 40m3 / hour.



- Dividing wagon
    - Runs on / over the main conveyor.
    - Will unload both left and right side.
- Controls
    - Special software and electronics to make the system work automatically.
- Excluding:
    - Construction parts to connect the main conveyor to the building.

K. Services

K.1 Start-up assistance & commissioning at first fill

For the start-up at first fill, Insect Engineers will provide assistance and commissioning, to be sure that you are informed of all the possibilities of the machinery, climate control and its functions. We will also check if the equipment is properly connected.

For warranty purposes, it is necessary to provide assistance and commissioning, otherwise it is not possible for Insect Engineers to issue a warranty.

We included 100 full days for the start-up to be sure that everything is working properly.
The start-up does not include the flight, traveling and hotel costs. Cost for food and drinks are mentioned separate. When more time on site is needed then that time is charged against € 800,- per day.

K.2 Consultancy & Training

All will be new so there is a lot of learning to do. To make your learning curve as short as possible, we offer intensive guidance in the first three months. This means that during that time, there will be somebody on site for 25 days while on other days, we offer remote growing support.

"At Insect Engineers, you're sure the BSF farm can be operated by farmers and workers and not by professors. This is also reflected in your cost price."

Delivery conditions and terms of payment

Prices	Excl. VAT, installation, transport, certificates and all other taxes and costs.
Delivery	EXW (Incoterms 2020) Nijverheidsstraat 2A, 5961PJ Horst, the Netherlands With the exception of vertical ZOEM racks.
Delivery time	In consultation.
Validity	This offer is valid for 14 days. Subject to price changes of raw material and exchange rates.
Payment	50% down payment when ordering, 50% when goods are ready for transport. For orders > 2 million euro, the last term of 50% must be guaranteed by a confirmed and approved Irrevocable Letter of Credit (ILC)
Transaction costs	All the related transaction costs are borne by the purchaser.
Marking	All machinery is made according to CE standards.
Manual	Instructions are given in a manual written in English. The customer agrees that translations of manuals in languages other than English will be at his expense.
Footage	The pictures and videos shown are examples. No rights can be derived from them.
Internet	For proper installation and service we need an internet connection with download speed of 20 Mbps and upload speed of 5 Mbps.
Conditions	Whenever we act as offeror or supplier, our offers, assignments given to us and agreements concluded with us are subject to the METAALUNIE TERMS AND CONDITIONS. These terms and conditions have been filed at the Registry of the Rotterdam District Court. Customers agree on purchase that it's forbidden to reproduce offered equipment for other projects and customers.
Power supply	400 V / 50 Hz / 3 Ph + 0 + earth. Keep in mind the EMC guideline.
Applicable law	Dutch law applies to all agreements of Insect Engineers. Disputes will be submitted to the court in Roermond, unless the magistrate is competent. Force majeure: in the event Insect Engineers cannot fulfil its obligations due to an event beyond its control, the agreement can be dissolved without compensation after mutual consultation with the customer. Damage to substrate and larvae is taken to mean growth and blossom damage.
Insurance	Excluded and to be arranged by principal building insurance Construction All Risk. The site owner is responsible for taking out insurance. At all times the customer is responsible to have the items already delivered at customers warehouse or project site insured against theft, fire, damage, etc.
Liability	The liability conditions are clearly stated in Article 13 of our general terms and conditions. Some examples include: - Consequential loss does not qualify for compensation. - Insect Engineers is not liable for damage caused by improper use. Please consult Article 13 for the full text.

Investment Prices

The table below gives you a good overview of the investment for a commercial BSF production facility. Ultimately, we must conduct specific engineering and make calculations to accommodate your local requirements and conditions. Please also note page 61-63 of what is so far not yet calculated.

Name	Quantity	Subtotal
A. Engineering		€ 85.000,-
A.1 Engineering	1	
B. Precision Breeding		€ 901.250,-
B.1 Complete set, including: • 2 special BSF sandwich panel rooms incl. lights • 2 climate units including 2 controllers with sensors • 189 love cages with moistening + egg collectors • 1 neonate counter with dosing conveyor • 1 feed mixer • Trays + plastic pallets + racks B.1.2-1.4: 1 tray filler + 1 tray cleaner + 1 tray tipper	1 set	
B.2 Options on further automation, see page 14.		*optional*
C. Buildings		€ 427.190,-
C.1 Special BSF sandwich panels	9 sets	
C.2 Growing room lights	270 units	
D+E. Supplies & Machinery		€ 837.710,-
D.1 Vertical ZOEM racks	5481m²	
D.2 ZOEM flex floors Option: Closed pvc bottom, more price: € 126.800,-	132 units	*included* *optional*
D.3 Rail and 2 electric platforms	9 sets + 2 units	
E.1 ZOEM Filler incl. automatic dosing 5-DOL	1 unit	
E.2 ZOEM puller	1 unit	
E.3 ZOEM supply conveyor	1 unit	
E.4 ZOEM hopper	1 unit	
E.5 ZOEM Emptying machine	1 unit	
E.6 ZOEM flex floor washer	1 unit	
E.7 ZOEM mixer + lift	1 set	
E.8 ZOEM washer + lift, optional, more price: € 56.800,-	1 set	*optional*
F. Climate		
F.1 Controller + sensors + 1 central for all rooms	9 sets	
F.2 Climate unit	9 units	

F.3 Automatic watering + 1 central for all rooms	9 sets	F.1-3: € 786.210,-
F.4 Central chiller 750kw cooling capacity Central heater 570kw heating capacity Excluding pipework from central items to climate units.	1 unit 1 unit	€ *being calculated* € 54.710,-
F.5 Biobed Excluding ductwork from rooms to biobed.		€ 121.000,-
G. Substrate Preparation		
Feed kitchen for 30-70 tons/day. More price: € 400.000 – 800.000,-		*To be calculated.*
H. Sieving		
G.1 Sieving in two steps + water bath etc.	1 set	€ 420.000,-
Options: Transport and dosing wagon in one. Additional equipment like water re-use, etc.. More price: € 90.000,-	 2 units 1 set	 € 198.000,- *optional*
I. Processing		
I.1-5 Drying, meal and oil. More price: € 2.100.000,-	1 set	*optional*
J. Frass Drying Tunnel		€ 268.470,-
J.1 Engineering	1 set	
J.2 Tunnel floor	2 sets	
J.3 Climate and controls	2 sets	
J.4 Machinery	1 set	
K. Services		
K.1 Start-up assistance & commissioning at first fill More days on request and against more price.	100 days	€ 85.000,-
K.2 Consultancy & training, on site and remote	3 months	€ 33.000,-
K.3 Small set of spare parts	1 set	€ 30.000,-
K.4 Packaging cost for transport.	1 set	€ 10.000,-
Total <u>excluding</u> options:		**€ 4.257.540,-**

Local Requirements

There are also local costs involvement. We will give you an overview of things to keep in mind. With this overview we try to be as complete and clear as possible. It stands that we supply what we have offered and this overview is for assistance purposes only.

Land

- The required land and provisions.
- Licenses and permits.
- Easy access road to the building site.
- Utilities installations.
- Site preparations.

Taxes

- Any taxes, import duties, certifications, etc.

Building

- All required foundations, concrete floors and concrete works.
- Concrete reinforcement.
- All sewage systems integrated in concrete floor.
- Covering halls. Steel structures. For at least your processing and substrate preparation area. If you work with sandwich panels at C.1 for production rooms and for the breeding rooms (B.1) then you also need a coverage building for this.
- All sanitary provisions.
- Office, canteen and all infrastructure rooms.
- Possible cold storage including compressor. You don't always need this but depends also on your end product. To be complete this is mentioned.
- Erection costs.
- Storage bunkers for possible raw materials storage.
- Architect + constructor costs.
- Building insurance all risk. The insurance must be taken care of by the owner of the building.
- Insurance against theft of materials and equipment.
- Storing and locking of all equipment during installation period.

Electricity Provisions

- Main distributor.
- Power supply cable chiller.
- Cable trays.
- Infra structure rooms.

- Lightning covering halls.
- Loading dock provisions.
- Outside provisions.

Main gas connection and piping.

- Main gas connection.
- Main water connection.
- Insulation of all the piping.

Transport and insurance.

Local Labor

- Insect Engineers supplies supervision, but there needs to be a local workforce.

Project Supervision

- Building supervisor. *(Note: we supply supervision as mentioned under 'Services'. But this supervisor is for the local covering halls.)*
- Recruiting staff.
- Additional days for Insect Engineers supervisor more then offered under 'Services'.

Electricity and Water

- Required water and electricity supply during building period.

Cleaning Pump System

- Borehole water pump.
- Water storage tank.
- High pressure pump unit.
- Main lines / valves.

Equipment

- Packaging machinery. *(Big bag filling station is included at section H.4. But when you desire other (small) packages then no equipment is included for this purpose.)*
- Substrate / raw material preparation equipment.
- Transport / dosing wagons.
- Additional neonate counters with automatic dosing.
- Frass processing *(Sieving is included, but offer stops after that. End up with a pile of frass.)*

Installation

- Supplier installation costs.
- Local installation costs.
- Travelling, transport, rental car, hotel and lodging expenses.
- Required building equipment as forklift, far reacher, crane, ladders, lifting platforms.
- Required tools as workbench with vice, fitting materials, electrical tools, etc.

Loaders

- Daily operation forklifts, loaders, pallet wagons, etc.

Other not mentioned cost.

Some of the above items we can offer and include but to do so we need more information of your project, like location, type of substrate, etc.

The above-mentioned price is exclusive of transport and all mounting and installation on site. If required, we can arrange transport and installation of the complete project for you, based on a separate agreement. Please let us know if you are interested in this.

A 12-month warranty on the products and services delivered by Insect Engineers is included, subject to the condition that you include the start-up visit during which we help you set up our products at your premises. Warranty ends or 12 months after start up or 15 months after loading, whatever comes first.

The investment will help in your long-term goal of speeding up to increase productivity.

We will always be available for you, also after the set-up, to ensure a smooth implementation of our products into your business.

Feel free to contact us for any questions or let us know when you are ready to proceed, so we can put everything into place.

Insect Engineers

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The Netherlands

T: *+31-77 205 8758*

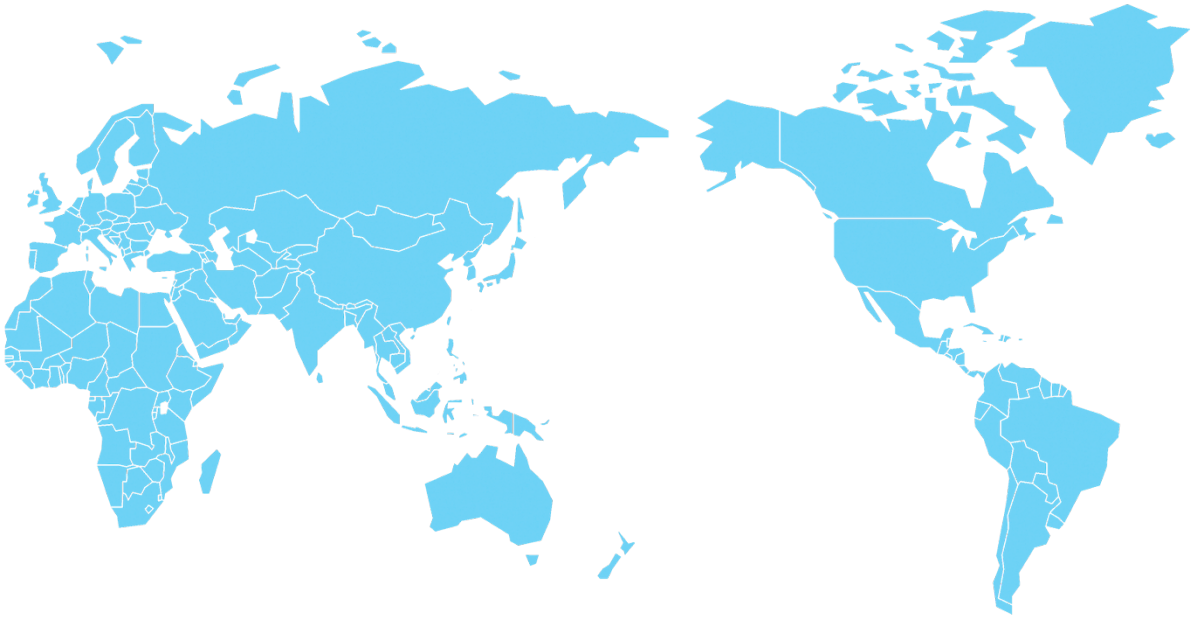
E: *info@insectengineers.com*

W: *www.insectengineers.com*

About us

Insect Engineers is an innovative company with the mission to make BSF farming as commercially attractive as possible. We do this by supplying turnkey systems but also by sharing knowledge through our Insect School.





Our solutions are available worldwide

References

We currently have contact in 94 countries worldwide. And are lucky enough to have some strong references. Our first project is so far still the biggest. This is: Sanergy based in Kenya. Handling 70.000 tons of waste per year. A movie can be found on: https://www.insectengineers.com/projects.





After that we have for example also supplied:

- United Kingdom: Resource Insects Ltd, we started a pilot facility in October 2021. In November 2022 the order was given for a brand new commercial factory handling about 70 tons of supermarket waste per day. Supermarket Tesco is directly involved and Insect Engineers has passed all their validation requirements (which is an achievement in itself).
- Chili: Natpro. Finalized commissioning in October 2022. They are large producer of small fish and have experience in BSF farming for many years. They recognized that the ZOEM rack system is far more commercially attractive then using trays. Their “pilot” consists of 3 commercial production rooms.
- Turkey: US Investor behind this. We are not allowed to share details on this project. But we supplied all the ZOEM rack equipment.
- Austria: *details coming.*
- Spain: *details coming.*
- Abu Dhabi: *details coming.*

Proud Founder

At Insect Engineers we're proud of the fact that we founded the Insect School in June 2022. The Insect School is the online and offline place to go when it comes to sharing knowledge about BSF farming.

More info on: www.insectschool.com.





Speaker

Bob Holtermans has been active as an entrepreneur since 2004, and founded Insect Engineers in 2019. A key characteristic of Bob is his practical approach. At some point we have to stop talking and start putting things into practice. In his view, that is the only way to really make a difference.

Furthermore, Bob is available as a speaker for conferences in the insect sector. With his experience, expertise and humor, he will convey his enthusiasm about the Black Soldier Fly to the entire audience. In addition, he will show why farming BSF is the way forward.

Please contact us for the various possibilities.

TERMS AND CONDITIONS OF THE METAALUNIE 1 January 2019

General Terms and Conditions issued by Koninklijke Metaalunie (the employers' organisation for small and medium-sized enterprises in the metal industry) referred to as TERMS AND CONDITIONS OF THE METAALUNIE, filed with the Registry of the Court of Rotterdam on 1 January 2019. Publication of the Koninklijke Metaalunie, P.O. Box 2600, 3430 GA, Nieuwegein. © Koninklijke Metaalunie

Article 1: Scope of application

1.1. These Terms and Conditions apply to all offers made by a Metaalunie member, to all agreements that it enters into and to all agreements arising from this, all of which insofar as the Metaalunie member is the supplier or the contractor.

1.2. Metaalunie members who apply these Terms and Conditions are referred to as the Contractor. The other party is referred to as the Client.

1.3. In the event of conflicts between the agreement entered into by the Client and the Contractor and these Terms and Conditions, the provisions of the agreement will prevail.

1.4. These Terms and Conditions may only be applied by Metaalunie members.

Article 2: Offers

2.1. All offers are without obligation. The Contractor is entitled to revoke its offer up to two working days after it has received the acceptance.

2.2. If the Client provides the Contractor with information, the Contractor may assume that it is accurate and complete and will base its offer on this information.

2.3. The prices stated in the offer are denominated in euros, excluding VAT and other government levies or taxes. The prices do not include travel, accommodation, packaging, storage and transport costs, nor do they include costs for loading, unloading and cooperating with customs formalities.

Article 3: Confidentiality

3.1. All information provided to the Client by or on behalf of the Contractor, such as offers, designs, images, drawings and know-how, of whatever nature and in whatever form are confidential, and the Client will not use it for any purpose other than for the implementation of the agreement.

3.2. The Client will not disclose or reproduce the information referred to in paragraph 1 of this article.

3.3. If the Client infringes one of the obligations referred to in paragraphs 1 and 2 of this article, it will owe an immediately payable penalty of € 25,000 for each infringement. This penalty can be claimed in addition to compensation by virtue of the law.

3.4. The Client must return or destroy the information referred to in paragraph 1 of this article immediately on request, within a period set at the discretion of the Contractor. If this provision is infringed, the Client will owe the Contractor an immediately payable penalty of € 1,000 per day. This penalty can be claimed in addition to compensation by virtue of the law.

Article 4: Advice and information provided

4.1. The Client cannot derive any rights from advice and information provided by the Contractor that is not directly related to the contract.

4.2. If the Client provides the Contractor with information, the Contractor may assume that it is accurate and complete when implementing the agreement.

4.3. The Client indemnifies the Contractor against any third-party claims related to the use of advice, drawings, calculations, designs, materials, brands, samples, models and the like provided by or on behalf of the Client. The Client will compensate the Contractor for all damage suffered by the Contractor, including all costs incurred for defence against these claims.

Article 5: Delivery time/implementation period

5.1. Delivery times or implementation periods specified are indicative.

5.2. The delivery time or implementation period only commences once an agreement has been reached on all commercial and technical details, once all the information, including final and approved drawings and the like, is in the possession of the Contractor, the agreed payment (or instalment) has been received, and the other conditions for the contract have been met.

5.3. If:

a. there are circumstances other than those known to the Contractor at the time it set the delivery period or implementation period, the delivery period or implementation period may be extended by the time the Contractor needs – taking into account its planning – to implement the contract under these circumstances;

b. there are contract extras, the delivery period or implementation period may be extended by the time the Contractor needs – taking into account its planning – to have the materials and parts delivered and to carry out the contract extras;

c. the Contractor suspends its obligations, the delivery period or implementation period may be extended by the time the Contractor needs – taking into account its planning – to implement the contract after the reason for the suspension no longer applies.

Unless the Client has evidence to the contrary, the duration of the extension of the delivery period or implementation period is presumed to be necessary and to be the result of a situation as referred to above in a to c.

5.4. The Client is obliged to pay all costs that the Contractor incurs or damages that the Contractor suffers as a result of a delay in the delivery or implementation period as stated in paragraph 3 of this article.

5.5. Under no circumstances does exceeding the agreed delivery or implementation period give the Client the right to compensation or to terminate the agreement. The Client indemnifies the Contractor against any third-party claims due to exceeding the delivery or implementation period.

Article 6: Delivery and risk transfer

6.1. Delivery takes place when the Contractor, at its business location, makes the good available to the Client and has informed the Client that the good is at its disposal. From that time onwards, the Client bears the risk of the good in terms of storage, loading, transport and unloading among others.

6.2. The Client and the Contractor may agree that the Contractor will be responsible for the transport. In that case too, the Client bears the risk of, inter alia, storage, loading, transport and unloading. The Client can insure itself against these risks.

6.3. If a good is exchanged and the Client retains the good to be exchanged pending delivery of the new good, the risk of the good to be exchanged remains with the Client until the time that it hands over the good to the Contractor. If the Client is unable to deliver the good to be exchanged in the condition in which it was when the agreement was concluded, the Contractor may terminate the agreement.

Article 7: Price changes

The Contractor may pass on to the Client an increase in cost-determining factors that occurs after entering into the agreement. The Client is obliged to pay the price increase immediately on the Contractor's request.

Article 8: Force majeure

8.1. If the Contractor fails to fulfil its obligations, this cannot be attributed to the Contractor if this failure is due to force majeure.

8.2. Force majeure includes, inter alia, if third parties engaged by the Contractor – such as suppliers, subcontractors and transporters, or other parties that the Client is dependent on – do not meet their obligations at all or on time, or circumstances due to weather conditions, natural disasters, terrorism, cybercrime, disruption of digital infrastructure, fire, power failures, loss, theft or loss of tools, materials or information, roadblocks, strikes or work interruptions and import or trade restrictions.

8.3. The Contractor is entitled to suspend fulfilment of its obligations if it is temporarily prevented from fulfilling its obligations to the Client due to force majeure. Once the force majeure circumstances no longer apply, the Contractor will fulfil its obligations as soon as its planning permits.

8.4. If it concerns force majeure and fulfilment is or becomes permanently impossible, or the temporary force majeure circumstances have lasted for more than six months, the Contractor is entitled to terminate the agreement with immediate effect either entirely or in part. In those cases, the Client is entitled to terminate the agreement with immediate effect, but only for that part of the obligations that the Contractor has not yet fulfilled.

8.5. The parties are not entitled to compensation for the damages suffered or to be suffered as a result of the force majeure, suspension or termination as referred to in this article.

Article 9: Scope of the work

9.1. The Client must ensure that all licences, exemptions and other decisions that are necessary to carry out the work are obtained in good time. The Client is obliged to send the Contractor a copy of the aforementioned documents immediately on the Contractor's request.

9.2. Unless otherwise agreed in writing, the work does not include:

a. groundwork, pile driving, cutting, breaking, foundation work, masonry, carpentry, plastering, painting, wallpapering, repair work or other construction work;

b. making connections to gas, water, electricity, internet or other infrastructural facilities;

c. measures to prevent or limit damage to, of theft or loss of goods present at or near the workplace;

d. removing equipment, building materials or waste;

e. vertical and horizontal transport.

Article 10: Contract extras

10.1. Changes in the work will in any event lead to contract extras if:

a. it concerns changes in the design, the specifications or the contract documents;

b. the information provided by the Client does not correspond with reality;

c. the estimated quantities deviate by more than 5%.

10.2. Contract extras are calculated on the basis of the price-determining factors that apply at the time the extra work is performed. The Client is obliged to pay the price for the contract extras immediately on the Contractor's request.

Article 11: Implementation of the work

11.1. The Client will ensure that the Contractor can carry out its work undisturbed and at the agreed time and that it is given the necessary facilities for the implementation of its work, such as:

a. gas, water, electricity and internet;

b. heating;

c. lockable dry storage space;

d. the facilities prescribed under the Dutch Working Conditions Act [Arbowet].

11.2. The Client bears the risk and is liable for damage to and theft or loss of goods belonging to the Contractor, Client and third parties, such as tools, material or equipment intended for the work or used for the work, located at or near the place where the work is carried out or at another agreed location.

11.3. Notwithstanding the provisions in paragraph 2 of this article, the Client is obliged to take out adequate insurance against the risks referred to in that paragraph. In addition, the Client must take out insurance for the risk of work-related damage with regard to the equipment to be used. The Client must send the Contractor a copy of the relevant insurance(s) and proof of payment of the premium immediately on request. In the event of damages, the Client is obliged to report this immediately to its insurer for further processing and settlement.

Article 12: Delivery of the work

12.1. The work is considered to be delivered in the following cases:

a. once the Client has approved the work;

b. if the Client has put the work into operation. If the Client puts part of the work into operation, then that part is considered to have been delivered;

c. if the Contractor has notified the Client in writing that the work has been completed, and the Client fails to inform the Contractor in writing that the work has not been approved within 14 days of the day of the notification;

d. if the Client does not approve the work on the grounds of minor defects or missing parts that can be repaired or delivered within 30 days and that do not hinder the commissioning of the work.

12.2. If the Client does not approve the work, it is obliged to inform the Contractor of this in writing, stating the reasons. The Client must give the Contractor the opportunity to deliver the work at a later date.

12.3. The Client indemnifies the Contractor against third-party claims concerning damage to parts of the work not delivered due to the use of parts of the work that have already been delivered.

Article 13: Liability

13.1. In the event of an attributable failure, the Contractor is still obliged to fulfil its contractual obligations, with due observance of Article 14.

13.2. The Contractor's obligation to compensate damages – regardless of the grounds – is limited to the damage against which the Contractor is covered under an insurance policy taken out by it or on its behalf. However, the scope of this obligation is never greater than the amount paid out under this insurance in the case in question.

13.3. If, for whatever reason, the Contractor does not have the right to invoke paragraph 2 of this article, the obligation to compensate damage is limited to a maximum of 15% of the total contract amount (excluding VAT). If the agreement consists of parts or partial deliveries, this obligation is limited to a maximum of 15% (excluding VAT) of the contract amount for that part or that partial delivery. If it concerns continuing performance contracts, the obligation to compensate damage is limited to a maximum of 15% (excluding VAT) of the contract amount owed over the last twelve months prior to the loss-causing event.

13.4. The following do not qualify for compensation:

a. consequential damages. Consequential damages include inter alia business interruption losses, loss of production, loss of profit, penalties, transport costs and travel and subsistence expenses;

b. damage to property in the care, custody or control of, but not owned by the insured party. Among other things, this damage includes damage caused by or during the performance of the work to goods that are being worked on or to goods that are located in the vicinity of the place where the work is being carried out;

c. damage as a result of intent or wilful recklessness by the Contractor's auxiliary staff or non-managerial subordinates.

The Client can take out insurance for these damages if possible.

13.5. The Contractor is not obliged to compensate damage to material supplied by or on behalf of the Client as a result of improper processing.

13.6. The Client indemnifies the Contractor against all third-party claims due to product liability as a result of a defect in a product that has been delivered by the Client to a third party and of which the products or materials supplied by the Contractor are a part. The Client is obliged to reimburse all the damages suffered by the Contractor in this respect, including the (full) costs of the defence.

Article 14: Guarantee and other claims

14.1. Unless otherwise agreed in writing, the Contractor guarantees the proper execution of the agreed performance for a period of six months after delivery or completion, as detailed in the following paragraphs.

14.2. If the parties have agreed to deviating guarantee conditions, the provisions of this article will remain in full force, unless this is in conflict with those deviating guarantee conditions.

14.3. If the agreed performance has not been executed properly, the Contractor will decide within a reasonable period of time whether it will still perform the work properly or credit the Client for a proportionate part of the contract amount.

14.4. If the Contractor opts to still execute the performance properly, it will determine the manner and time of execution. The Client must in all cases offer the Contractor the opportunity to do so. If the agreed performance (also) included the processing of material provided by the Client, the Client must supply new material at its own expense and risk.

14.5. The Client is responsible for sending parts or materials that are to be repaired or replaced by the Contractor to the Contractor's business location.

14.6. The following are for the Client's account:

a. all transport or shipping costs;

b. costs for dismantling and assembly;

c. travel and subsistence expenses and travel time.

14.7. The Contractor is only obliged to implement the guarantee if the Client has fulfilled all its obligations.

14.8. a. The guarantee does not cover defects that are the result of:

- normal wear and tear;
- improper use;
- lack of maintenance or maintenance carried out incorrectly;
- installation, assembly, modification or repairs carried out by the Client or third parties;
- faulty or unsuitable goods originating from or prescribed by the Client;
- faulty or unsuitable materials or tools used by the Client.

b. No guarantee is given for:

- goods delivered that were not new at the time of delivery;
- inspections and repairs carried out on goods owned by the Client;
- parts that are subject to a manufacturer's guarantee.

14.9. The provisions of paragraphs 3 to 8 of this article apply by analogy to any of the Client's claims based on breach of contract, non-conformity or any other basis whatsoever.

Article 15: Obligation to complain

15.1. The Client no longer has the right to invoke a defective performance if it has not complained to the Contractor in writing within fourteen days after it discovered or should reasonably have discovered the defect.

15.2. The Client must have filed complaints about the invoice with the Contractor in writing and within the payment term, subject to forfeiture of all rights. If the payment term is longer than thirty days, the Client must have filed its complaint in writing within thirty days of the invoice date at the latest.

Article 16: Failure to take possession of goods

16.1. The Client is obliged to take actual possession of the goods that are the subject of the agreement at the agreed location at the end of the delivery or implementation period.

16.2. The Client must cooperate fully and free of charge to enable the Contractor to deliver the goods.

16.3. Goods not taken into possession are stored at the Client's expense and risk.

16.4. If the provisions of paragraph 1 or 2 of this article are infringed, the Client will owe the Contractor a penalty for each infringement of € 250 per day up to a maximum of € 25,000, after the Contractor has given notice of default. This penalty can be claimed in addition to compensation by virtue of the law.

Article 17: Payment

17.1. Payment is made at the Contractor's business address or into an account to be designated by the Contractor.

17.2. Unless otherwise agreed, payments must be made within 30 days of the invoice date.

17.3. If the Client fails to fulfil its payment obligation, it is obliged to comply with a request from the Contractor for a tender of payment instead of the agreed amount.

17.4. The Client's right to offset its claims against the Contractor or to suspend the fulfilment of its obligations is excluded, unless the Contractor has been granted a suspension of payments or is bankrupt or the statutory debt adjustment scheme applies to the Contractor.

17.5. Irrespective of whether the Contractor has fully executed the agreed performance, everything that the Client owes or will owe it under the agreement is immediately due and payable if:

a. a payment term has been exceeded;

b. the Client does not fulfil its obligations under Article 16;

c. the Client has filed for bankruptcy or suspension of payments;

d. the Client's goods or claims have been attached;

e. the Client (a company) is dissolved or wound up;

f. the Client (a natural person) files a application to be admitted to the statutory debt adjustment scheme, is placed under a guardianship order or has died.

17.6. If payment is delayed, the Client will owe interest on that sum to the Contractor with effect from the day following the day agreed as the final day of payment up to and including the day on which the Client settles the amount in question. If the parties have not agreed on the final day of payment, the interest is due from 30 days after the sum has become due and payable. The interest is 12% per year, but is equal to the statutory interest if this is higher. For the interest calculation, a part of the month is considered to be a full month. At the end of each year, the amount on which the interest is calculated will be increased by the interest due for that year.

17.7. The Contractor is entitled to offset its debts to the Client against claims that companies affiliated to the Contractor have against the Client. In addition, the Contractor is entitled to offset its claims to the Client against debts that companies affiliated to the Contractor have against the Client. Furthermore, the Contractor is entitled to offset its debts to the Client against claims against companies affiliated to the Client. 'Affiliated companies' means all companies belonging to the same group, within the meaning of Book 2, Section 24b of the Dutch Civil Code, and a participation within the meaning of Book 2, Section 24c of the Dutch Civil Code.

17.8. For late payments, the Client owes the Contractor all extrajudicial costs with a minimum of € 75.

These costs are calculated on the basis of the following table, i.e., the principal sum plus interest:

on the first € 3,000 15%
on the excess up to € 6,000 10%
on the excess up to € 15,000 8%
on the excess up to € 60,000 5%
on the excess from € 60,000 or more 3%

The extrajudicial costs actually incurred are due if they are higher than the calculation given above.

17.9. If judgment is rendered in favour of the Contractor in legal proceedings, either entirely or for the most part, the Client will bear all costs incurred in connection with these proceedings.

Article 18: Securities

18.1. Irrespective of the agreed payment terms, the Client is obliged to provide sufficient security for payment immediately on the Contractor's request and at its discretion. If the Client does not comply with this provision within the set time limit, it will immediately be in default. In that case, the Contractor has the right to terminate the agreement and to recover its damages from the Client.

18.2. The Contractor remains the owner of the delivered goods as long as the Client:

a. has not fulfilled its obligations under any agreement with the Contractor;

b. claims arising from non-fulfilment of the aforementioned agreements, such as damage, penalties, interest and costs, have not been settled.

18.3. As long as the delivered goods are subject to retention of title, the Client may not encumber or dispose of these goods other than in the course of its normal business operations. This provision has effect under property law.

18.4. After the Contractor has invoked its retention of title, it may take back the delivered goods. The Client will cooperate fully with this.

18.5. If the Client has fulfilled its obligations after the Contractor has delivered the goods to it in accordance with the agreement, the retention of title with respect to these goods is revived if the Client does not fulfil its obligations under an agreement entered into subsequently.

18.6. The Contractor has a right of pledge and a right of retention on all goods that it has or may receive from the Client on any grounds whatsoever and for all claims that it has or might have against the Client.

Article 19: Intellectual property rights

19.1. The Contractor is considered to be the maker, designer or inventor of the works, models or inventions created in the context of the agreement. The Contractor therefore has the exclusive right to apply for a patent, trademark or model.

19.2. The Contractor will not transfer any intellectual property rights to the Client in the implementation of the agreement.

19.3. If the performance to be delivered by the Contractor (also) includes providing computer software, the source code will not be handed over to the Client. The Client will only acquire a non-exclusive, worldwide and perpetual licence for use for the computer software solely for the purpose of the normal use and proper functioning of the good. The Client is not permitted to transfer the licence or to issue a sub-licence. When the Client sells the good to a third party, the licence transfers by operation of law to the acquirer of the good.

19.4. The Contractor disclaims liability for damages that the Client suffers as a result of an infringement of third-party intellectual property rights. The Client indemnifies the Contractor against any third-party claims related to an infringement of intellectual property rights.

Article 20: Assignment of rights or obligations

The Client may not assign or pledge any rights or obligations pursuant to any article in these General Terms and Conditions or the underlying agreement(s), unless it has the prior written consent of the Contractor. This provision has effect under property law.

Article 21: Cancellation or termination of the agreement

21.1. The Client is not entitled to cancel or terminate the agreement, unless the Contractor agrees to this. If the Contractor agrees, the Client will owe the Contractor an immediately due and payable compensation equal to the agreed price, less the savings for the Contractor as a result of the termination. The compensation will be at least 20% of the agreed price.

21.2. If the price depends on the actual costs to be incurred by the Contractor (on a cost-plus basis), the compensation as referred to in the first paragraph of this article is estimated based on the sum of the costs and labour and the profit that the Contractor would have made for the entire contract.

Article 22: Applicable law and competent court

22.1. Dutch law applies.

22.2. The Vienna Sales Convention (CISG) does not apply, nor does any other international regulation that may be excluded.

22.3. The Dutch civil court with jurisdiction in the Contractor's place of business is authorised to take cognisance of any disputes. The Contractor may deviate from this rule governing jurisdiction and rely on the statutory rules governing jurisdiction instead.

These Terms and Conditions constitute a comprehensive translation of the Dutch version of the Terms and Conditions of the Metaalunie as filed with the Registry of the Court of Rotterdam on 1 January 2019. The Dutch version will prevail in the explanation and interpretation of this text.