

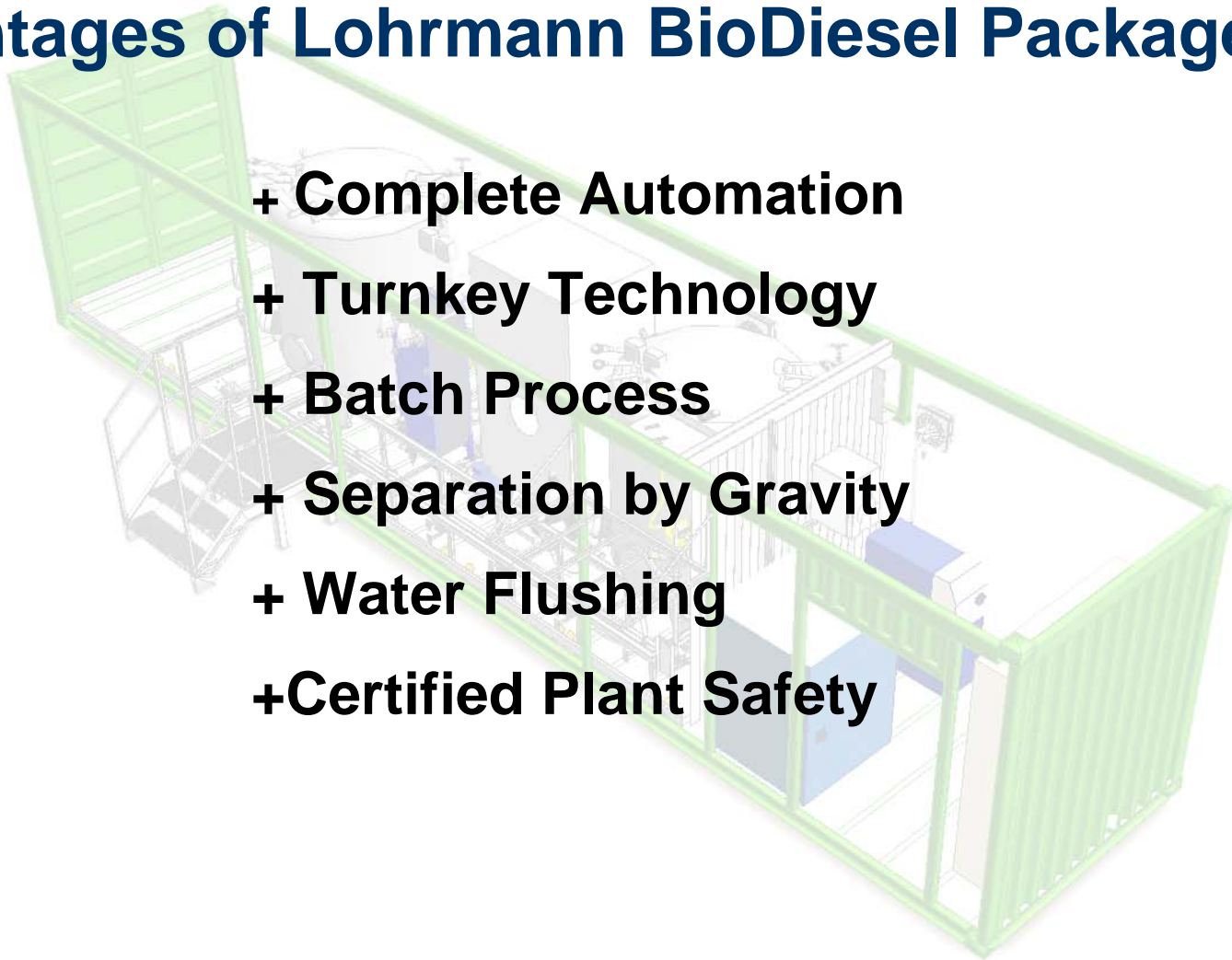


# **Advantages of the Standardized Modular Package for the Production of Biodiesel**



## Advantages of Lohrmann BioDiesel Packages

- + Complete Automation
- + Turnkey Technology
- + Batch Process
- + Separation by Gravity
- + Water Flushing
- + Certified Plant Safety

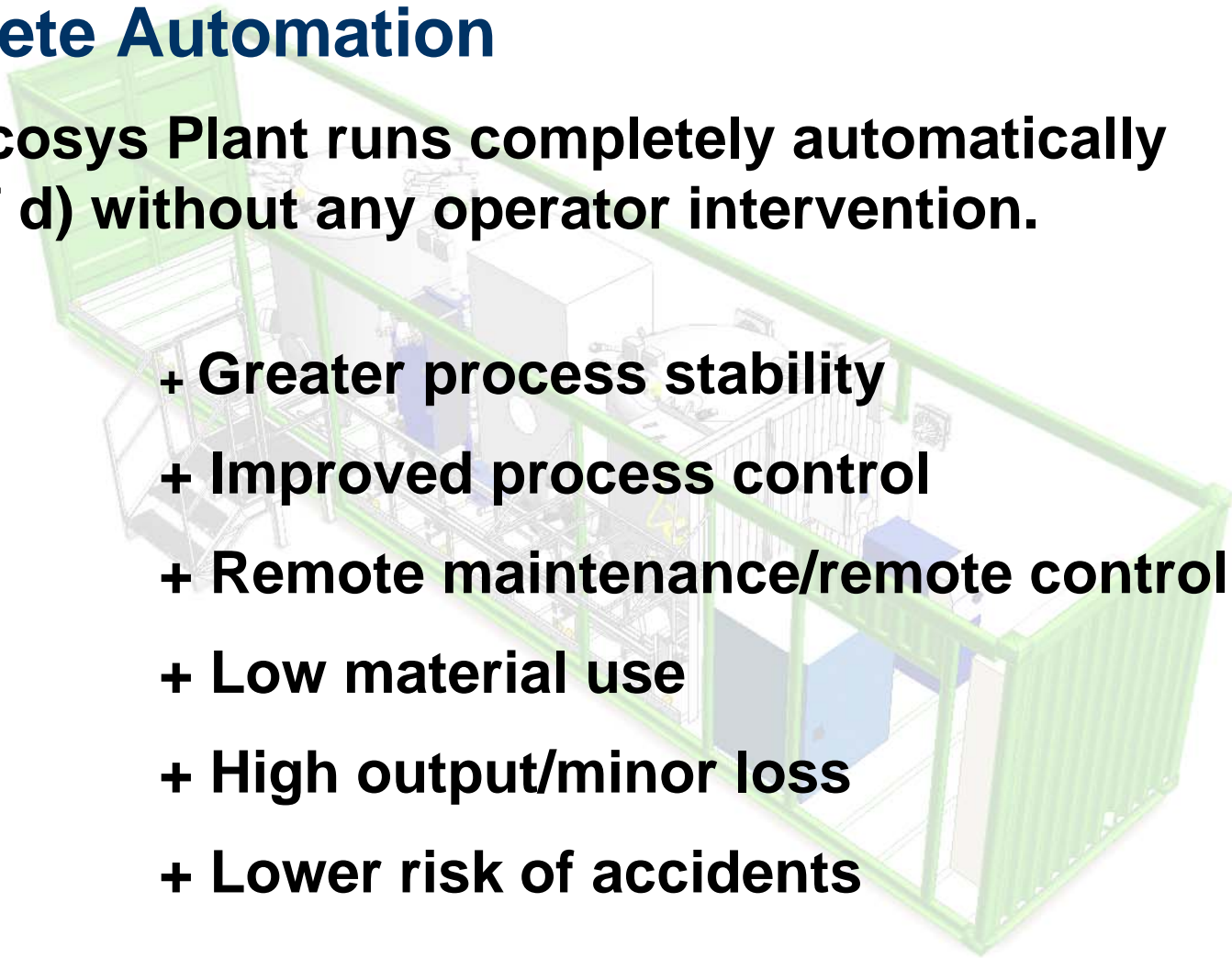




## Complete Automation

The Oecosys Plant runs completely automatically (24 h / 7 d) without any operator intervention.

- + Greater process stability
- + Improved process control
- + Remote maintenance/remote control
- + Low material use
- + High output/minor loss
- + Lower risk of accidents



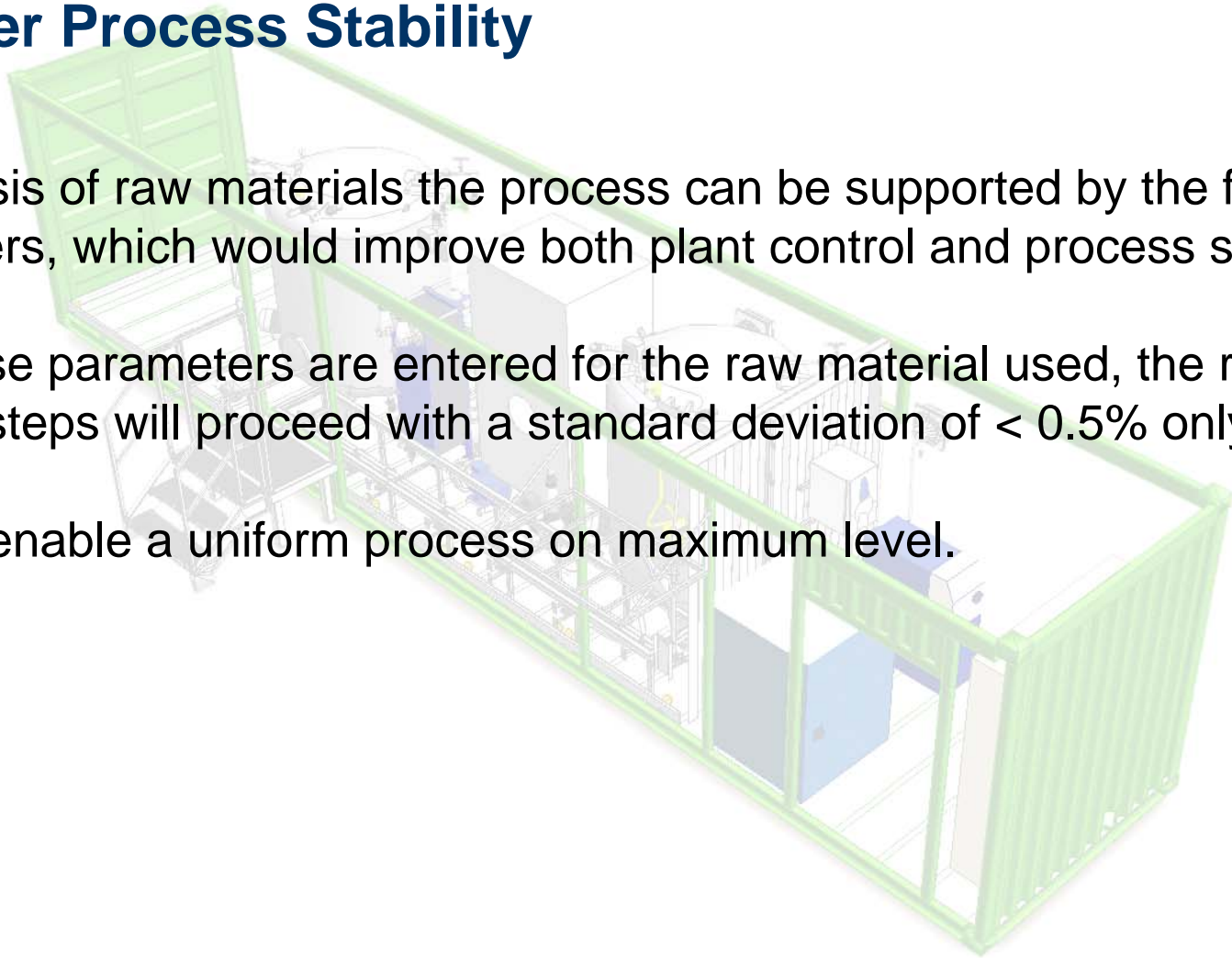


- **Greater Process Stability**

By analysis of raw materials the process can be supported by the fitting parameters, which would improve both plant control and process stability.

After these parameters are entered for the raw material used, the relevant process steps will proceed with a standard deviation of  $< 0.5\%$  only.

This will enable a uniform process on maximum level.





- **Improved Process Control**

Potential process disturbances (e.g. by "out of spec." raw materials and auxiliaries) are recognised by the programme.

An error message (even by SMS and e-mail) will be released and the process will be stopped. This reliably prevents that "poor" BioDiesel not conforming to the standard is pumped into the storage tank where it contaminates large volumes of good Bio-Diesel.

In a bio-diesel tank with a volume up to 100 sq.mtrs., an undiscovered poor charge may cause a damage of several ten-thousands of Euro.



## • Remote Maintenance and Control

By linkage to the internet, the plant can be viewed and controlled from any computer with a secured, password protected access.

Every staff member may be assigned a different user category conforming to this competence. Programme updates are provided via internet. Production protocols and charge records can be viewed via internet and transferred directly to the material procurement system.

In case of any process disturbances, our experts are able to prepare diagnostics within a short time and, in most cases, eliminate the problem “online”.

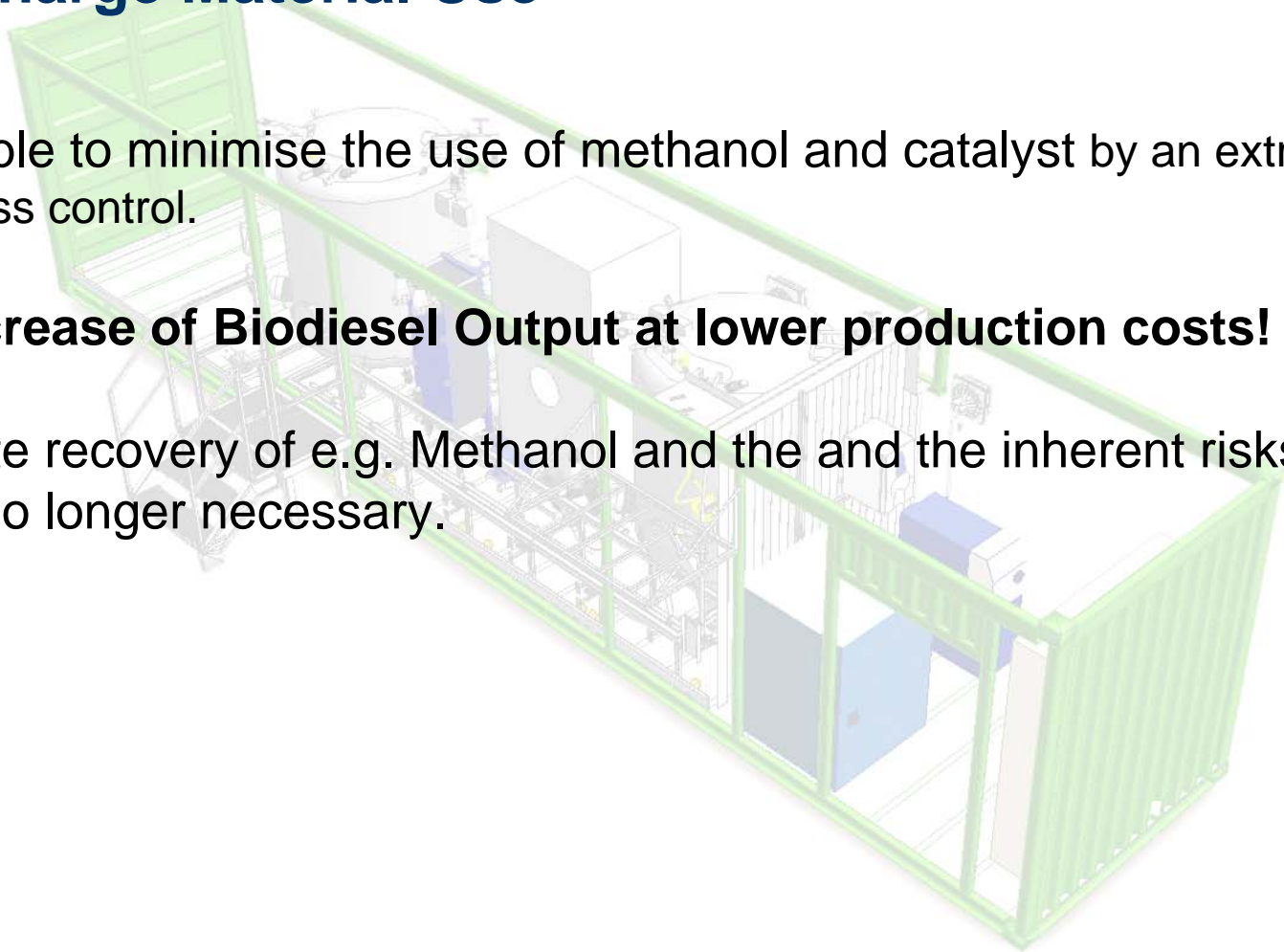


- **Low Charge Material Use**

It is possible to minimise the use of methanol and catalyst by an extremely tight process control.

➔ **Increase of Biodiesel Output at lower production costs!**

An intricate recovery of e.g. Methanol and the and the inherent risks is possibly no longer necessary.





- **Lower Risk of Accidents**

During manual or semi-automatic operation, opening an incorrect valve or starting certain units at the wrong time may, in the best case, prevent the charge to reach the standard requirement, in a more severe case, toxic vapours or irritating fluids may be omitted, or fire and explosions may occur (risk of life!).

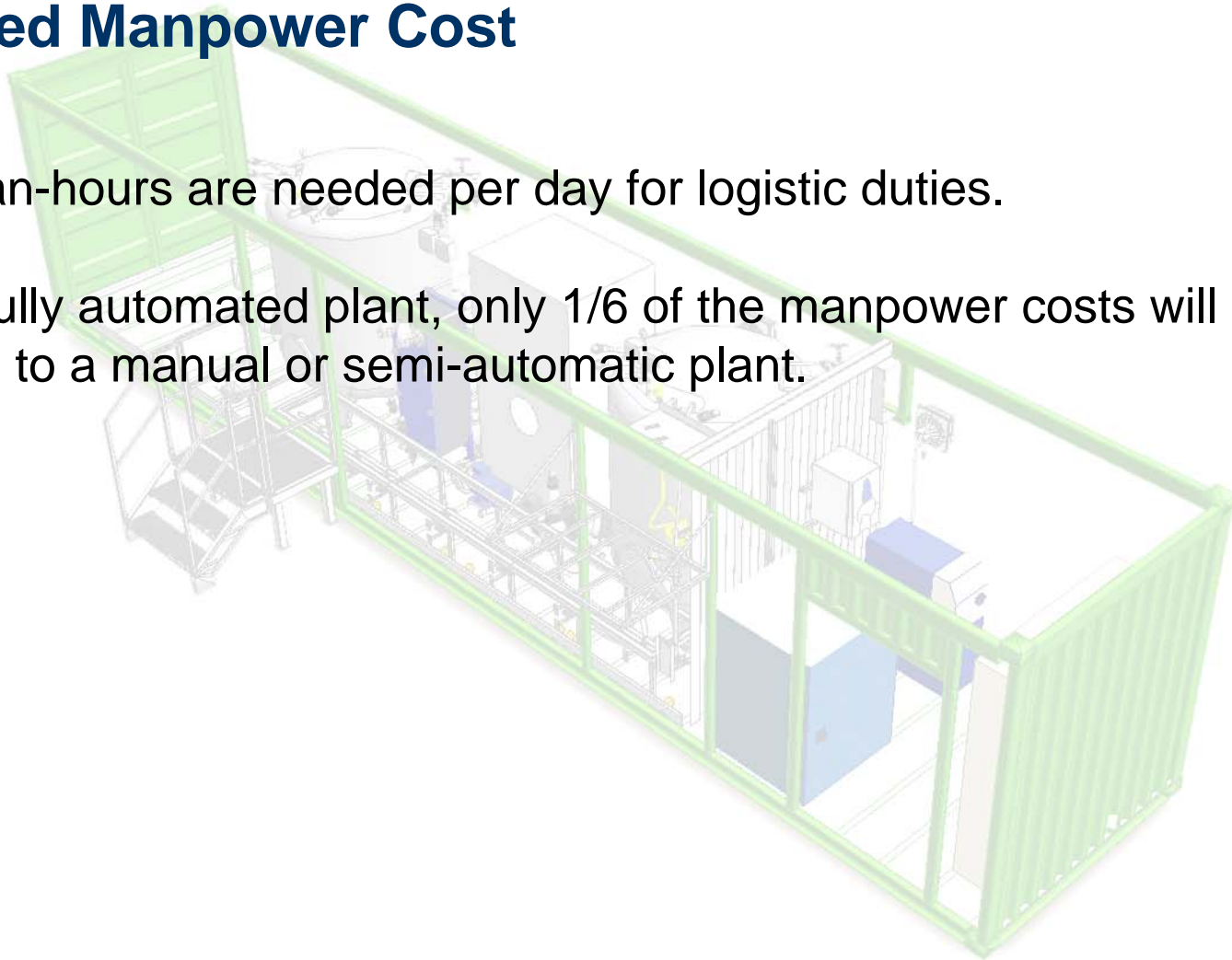
This risk is almost excluded with our Plant, because not only several motors are in the ATEX standard, but the complete system. This includes the selection of materials (no plastic surfaces and hoses, which might lead to sparking) up to safety monitoring of all aggregates. Additionally, our container plant is characterised by a gas-tight sealing between the production room (reactors, pumps,...) and the control room (control cupboard, operating panel,...). The operators are not necessarily supposed to walk into the production room.



- **Lowered Manpower Cost**

Only 4 man-hours are needed per day for logistic duties.

With the fully automated plant, only 1/6 of the manpower costs will develop compared to a manual or semi-automatic plant.

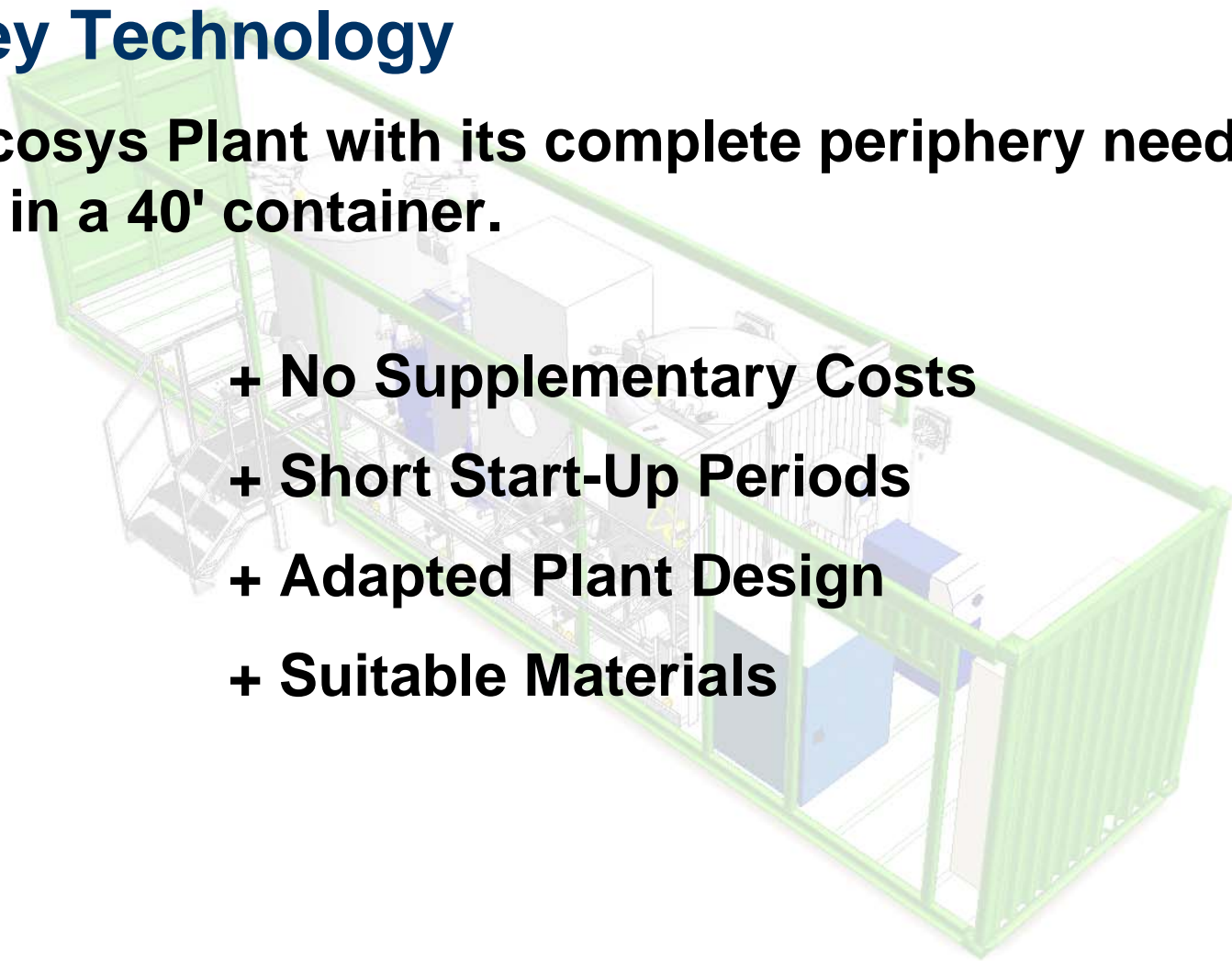




## Turnkey Technology

The Oecosys Plant with its complete periphery needed is housed in a 40' container.

- + No Supplementary Costs
- + Short Start-Up Periods
- + Adapted Plant Design
- + Suitable Materials



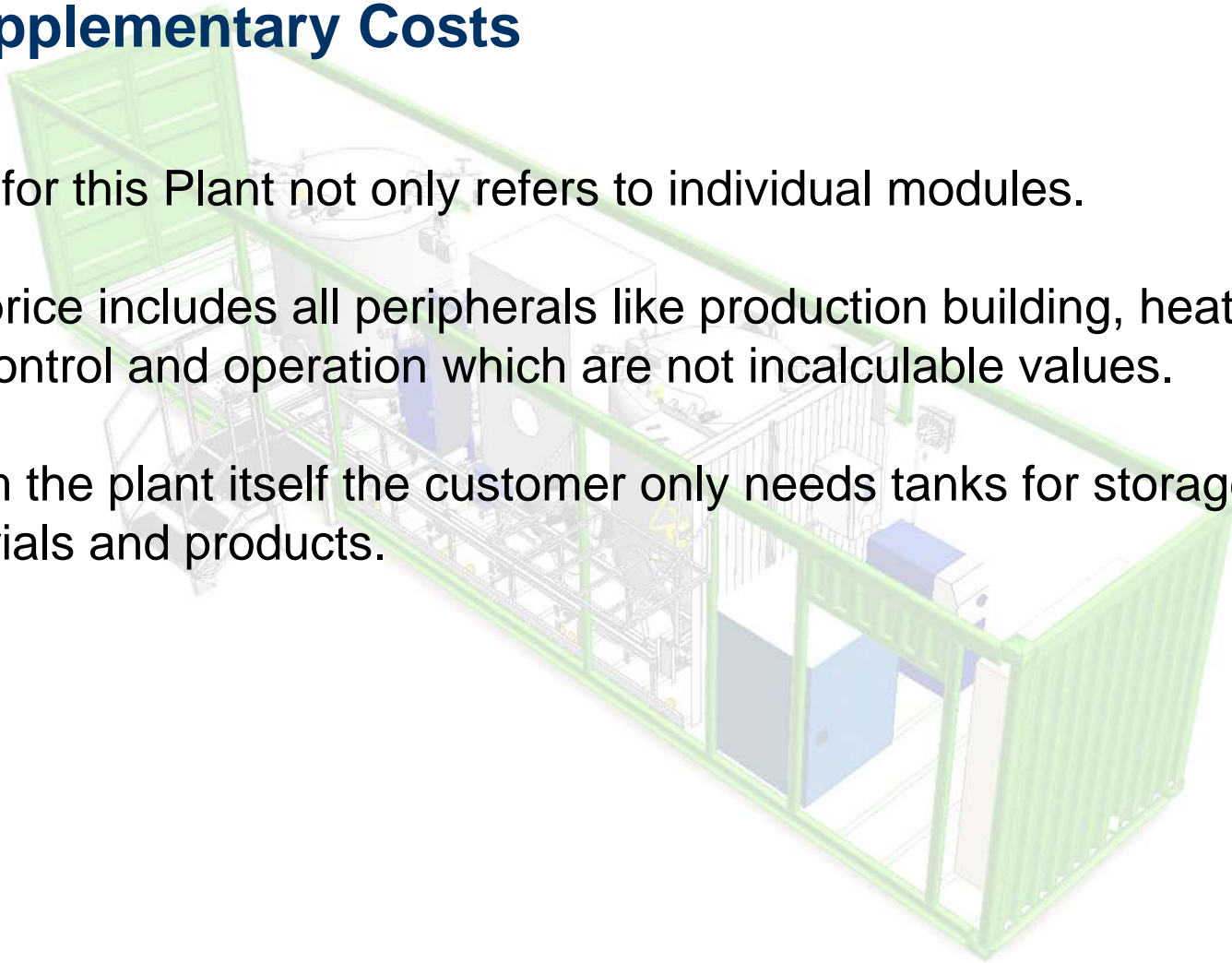


- **No Supplementary Costs**

The price for this Plant not only refers to individual modules.

The end price includes all peripherals like production building, heating, cooling, control and operation which are not incalculable values.

Apart from the plant itself the customer only needs tanks for storage of his raw materials and products.





- **Short Start-Up Periods**

As soon as the tanks, piping systems, electric and water connections have been installed, the production container can be delivered and connected within a few hours, provided there exist adequate customer preparations.

The plant is thereby ready for service immediately and after a very short time it can start production at full capacity.





- **Adapted Plant Design**

Constructional safety aspects will be implemented directly by the adapted plant design. For example, the production segment is equipped with facilities like eye- and safety showers.

Additionally, controlled ventilation of the production segment is provided already by controlled fan units. The required separation between electrical components approved for non-explosive service and such for explosive areas has been planned by experts and verified by independent auditors.

This reduces the risks of the complete plant to a minimum extent.



- **Suitable Materials**

Only materials which are resistant and tight throughout long service are used in all production areas.

There do not exist any low-priced plastic pipes and seals that would entail lack of resistance and on the long run high repair and maintenance costs.

All vessels and pipelines are made of stainless steel, rubber gaskets in piping systems have been replaced by conical seals, and valves or pump seals are made from PTFE or comparable materials that are resistant against long-time exposure to bio-diesel.



## Batch Process

All process steps of an Oecosys Plant proceed in one single reactor.

- + No Acceleration / Deceleration Losses
- + No-Loss Operation at Partial Load
- + Quick Adaptation of Process to Raw Material Changes
- + Lower Investments
- + Good Process Control Methods



- **No Acceleration / Deceleration Losses**

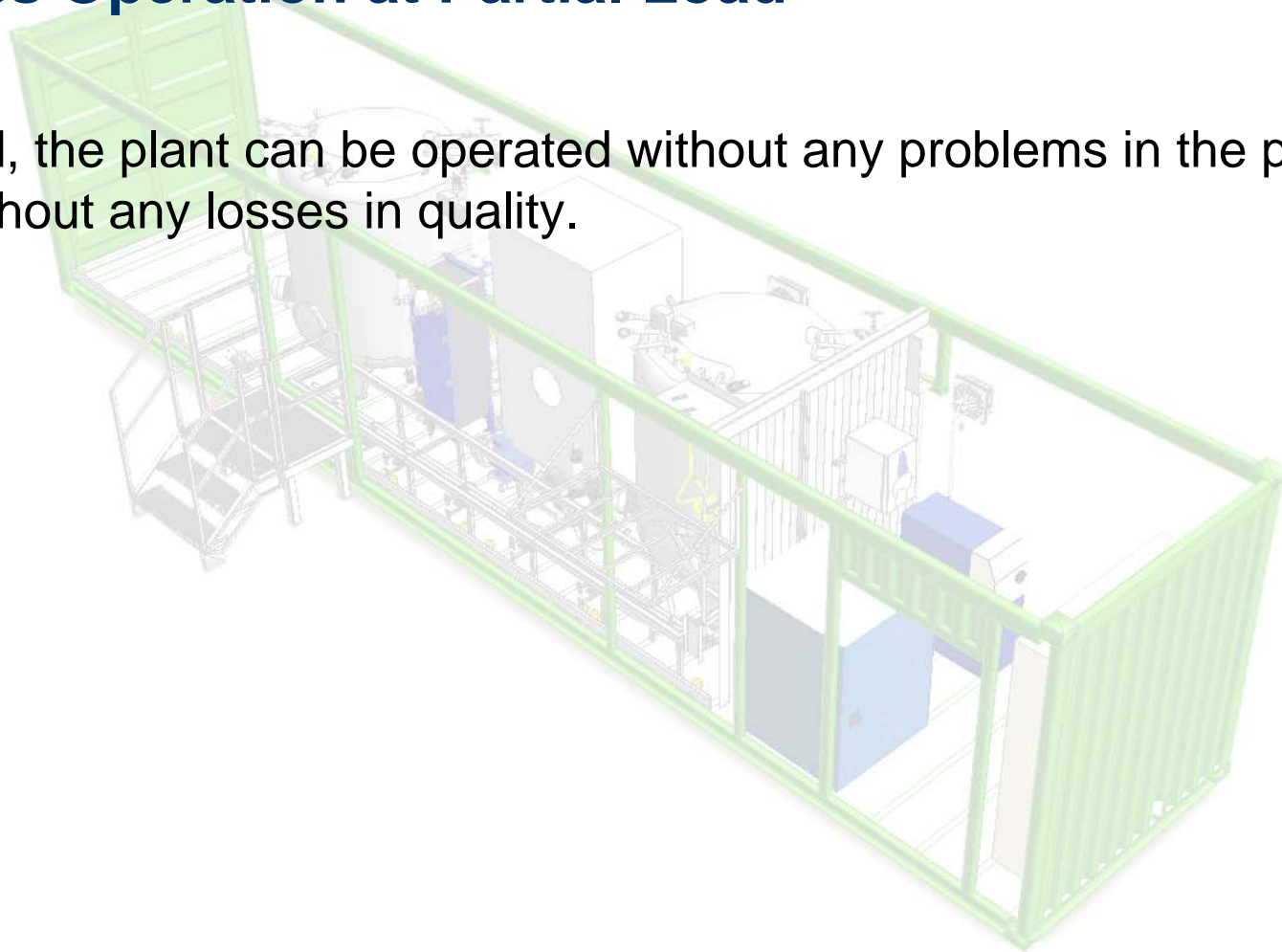
In general, continuously operating reactor systems processing very high quality raw materials must be operated continuously with extremely low quality deviations.

After short operation interruptions, as they might happen in practice e.g. by power failures or after breaks (e.g. Christmas), continuously running plants may suffer acceleration/deceleration losses and consequently variations in bio-diesel quality.



- **No-Loss Operation at Partial Load**

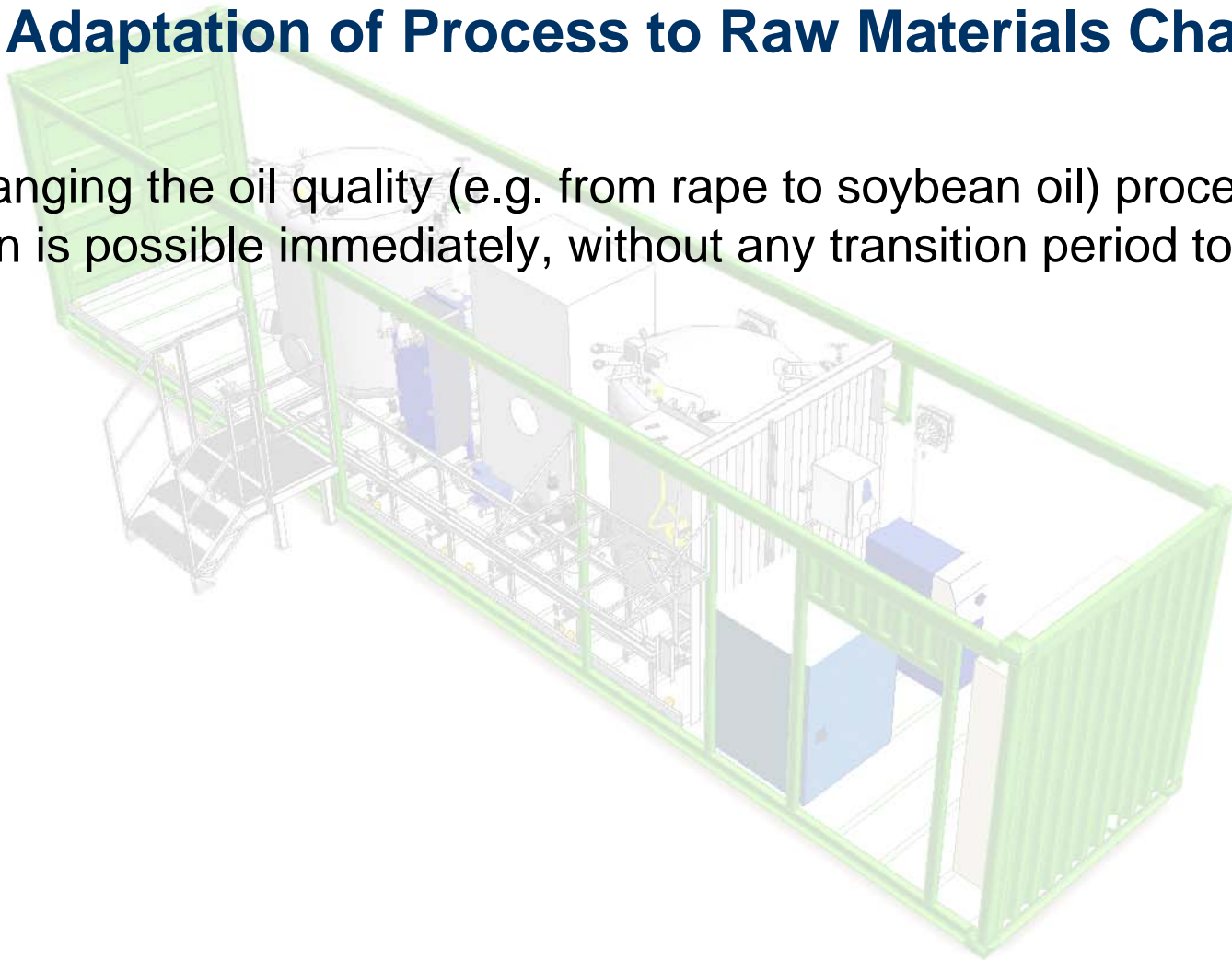
If required, the plant can be operated without any problems in the partial load mode, without any losses in quality.





- **Quick Adaptation of Process to Raw Materials Changes**

When changing the oil quality (e.g. from rape to soybean oil) process adaptation is possible immediately, without any transition period to the next charge.





- **Lower Investments**

There exist two reactors for two processes in the batch process. These are equipped by all safety facilities as well as measuring and control means, permitting a fully automatic and reliable operation.

Every additional reactor with its relevant pumps would need further instruments for an automatic continuous process, which would increase the investments. At a comparable technical standard, the lower specific investments of the batch process can be achieved by continuous processes only if safety equipment is waived or the plants have a production capacity that is higher by several factors.

By the batch process it is possible to achieve relatively low investments, despite using industrial components of maximum quality.

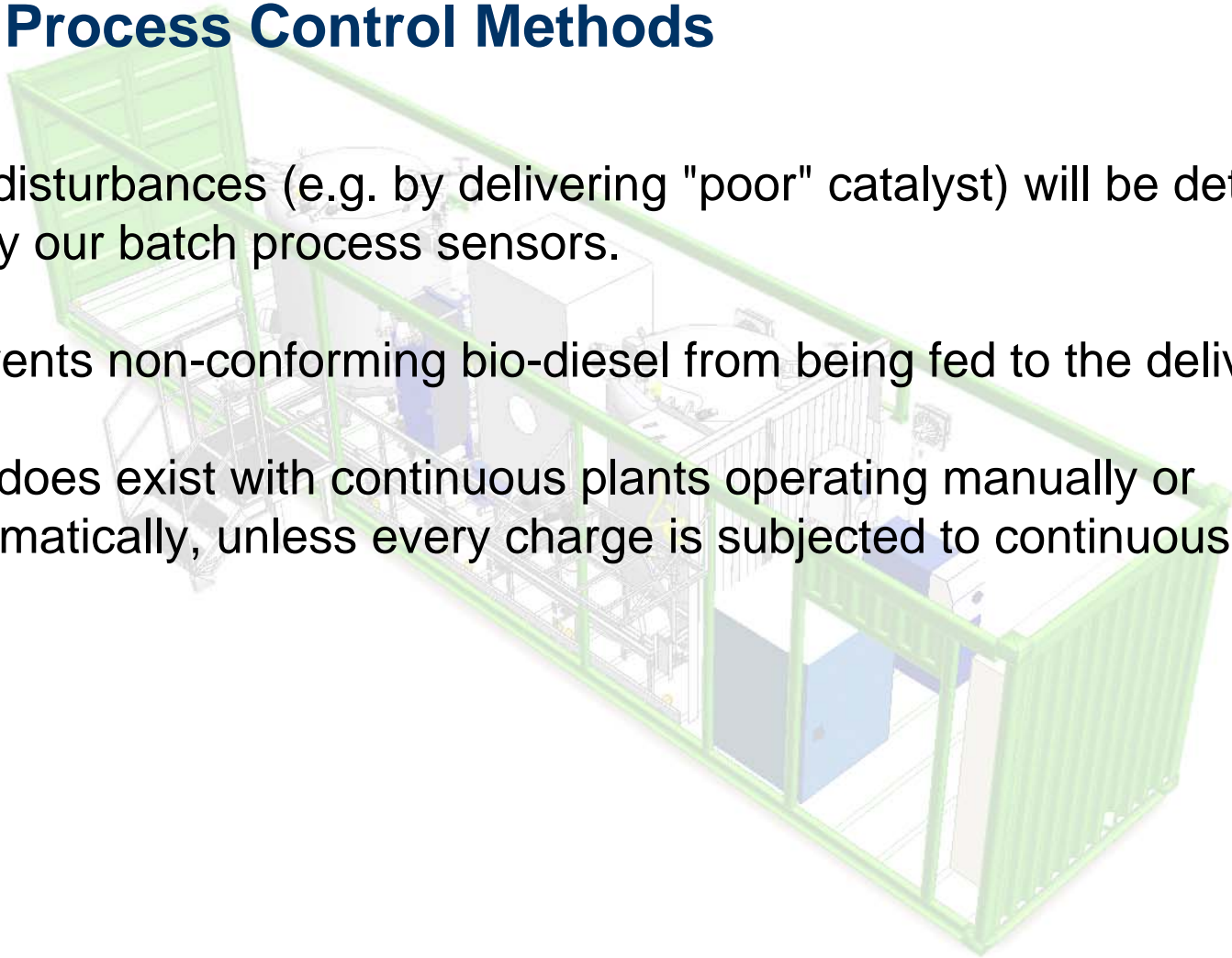


- **Good Process Control Methods**

Process disturbances (e.g. by delivering "poor" catalyst) will be detected reliably by our batch process sensors.

This prevents non-conforming bio-diesel from being fed to the delivery tank.

This risk does exist with continuous plants operating manually or semiautomatically, unless every charge is subjected to continuous analysis.

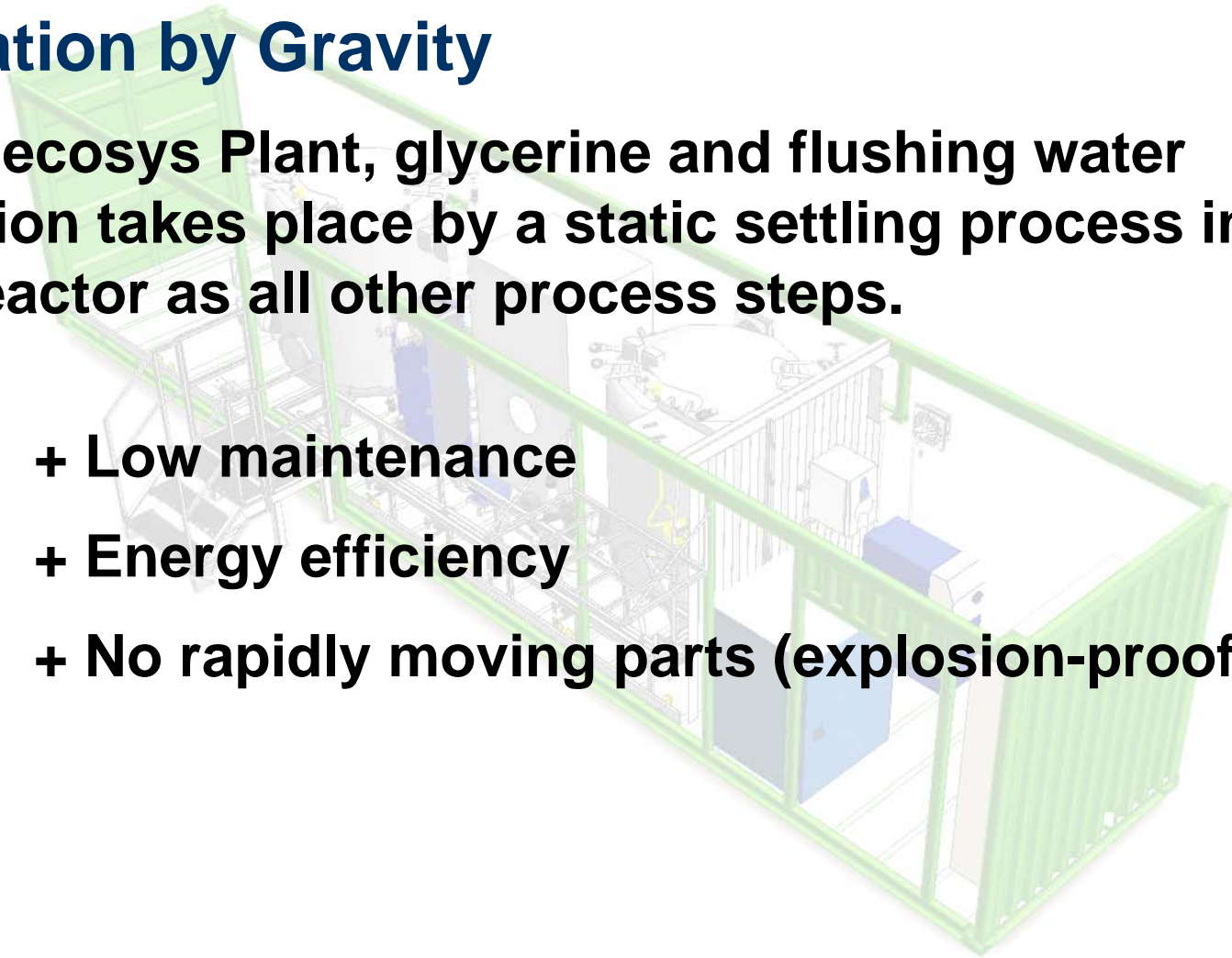




## Seperation by Gravity

In the Oecosys Plant, glycerine and flushing water separation takes place by a static settling process in the same reactor as all other process steps.

- + Low maintenance
- + Energy efficiency
- + No rapidly moving parts (explosion-proofness)

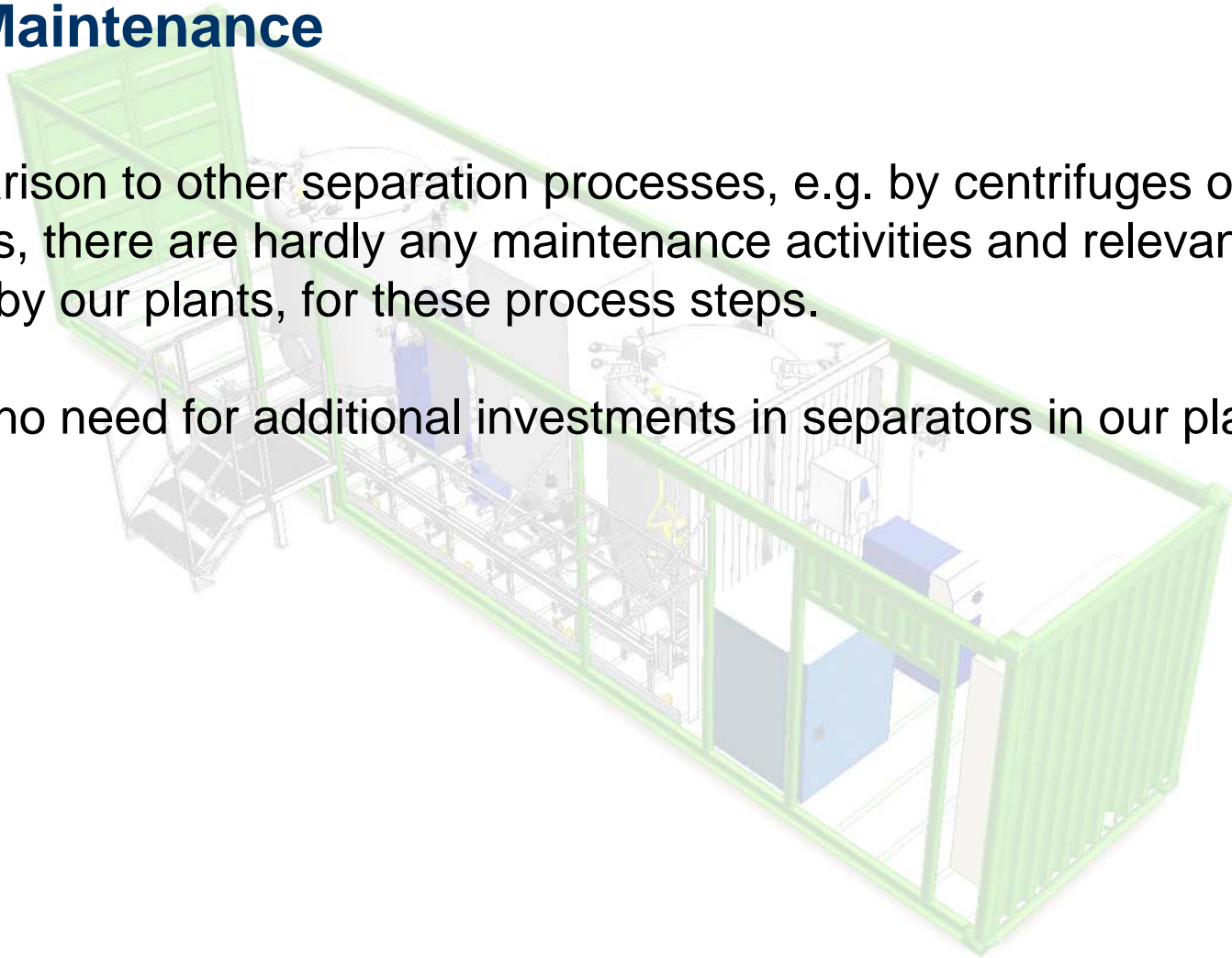




- **Low Maintenance**

In comparison to other separation processes, e.g. by centrifuges or decanters, there are hardly any maintenance activities and relevant costs required by our plants, for these process steps.

There is no need for additional investments in separators in our plants.

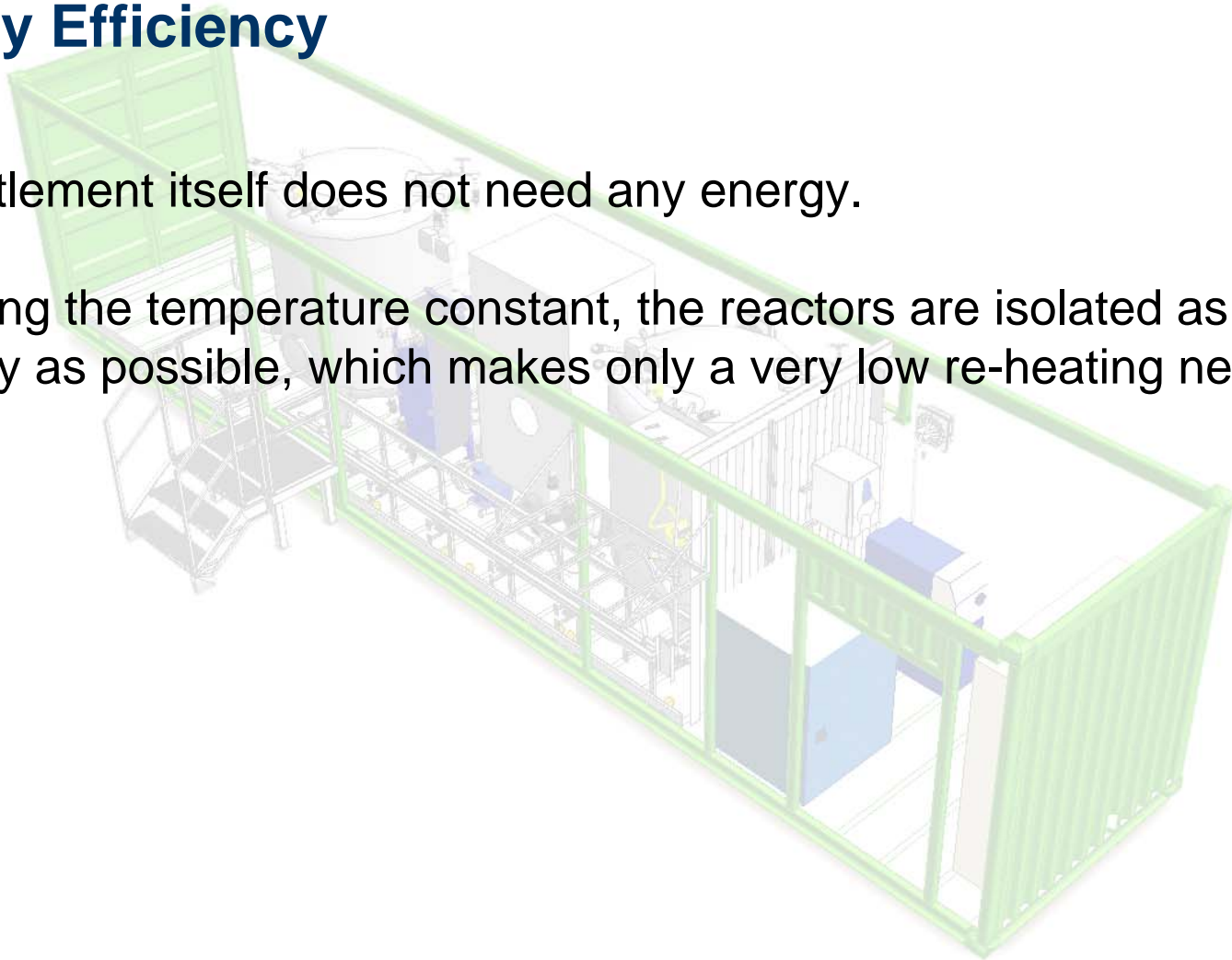




- **Energy Efficiency**

Static settlement itself does not need any energy.

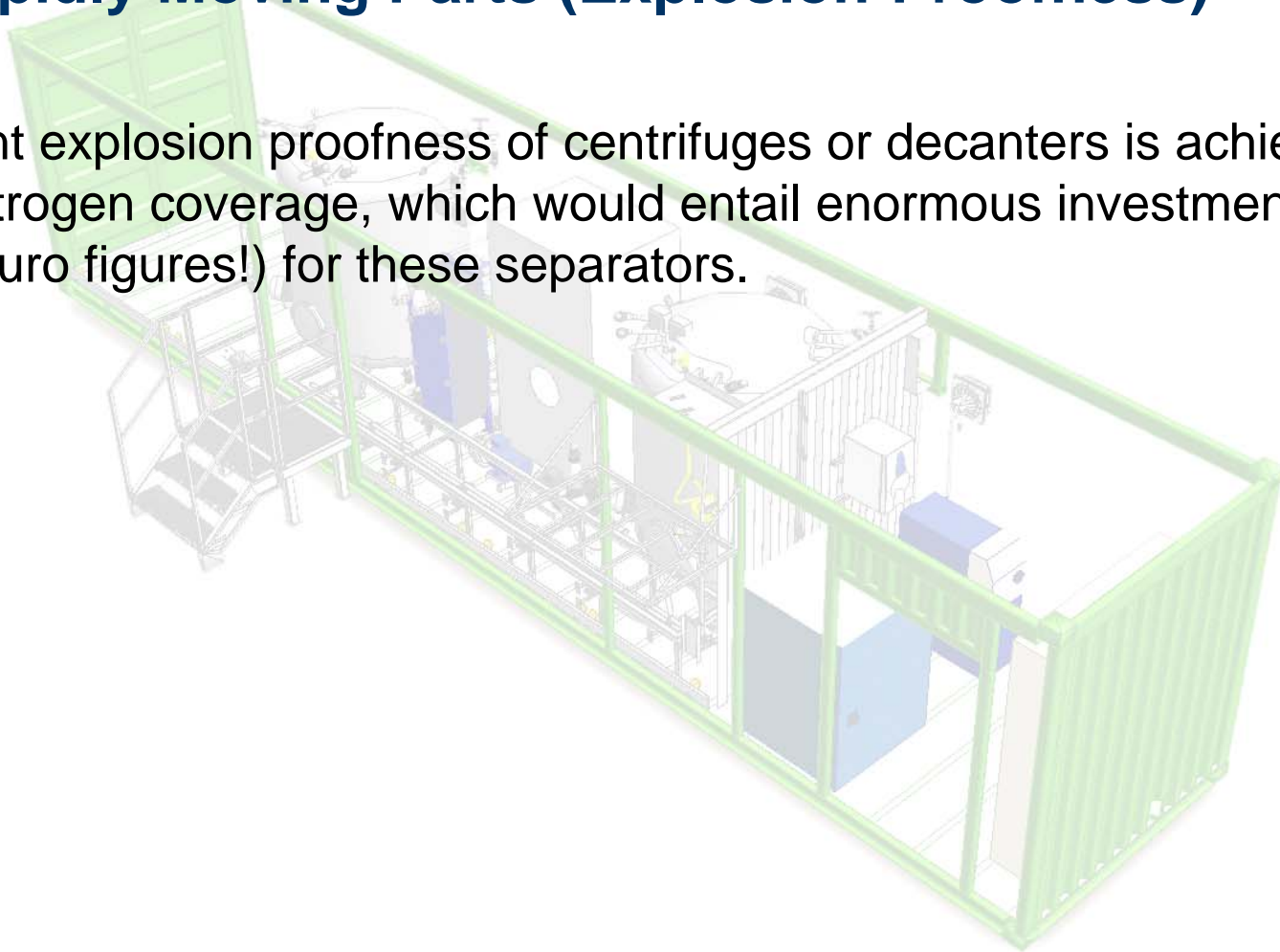
For keeping the temperature constant, the reactors are isolated as thoroughly as possible, which makes only a very low re-heating necessary.





- **No Rapidly Moving Parts (Explosion-Proofness)**

A sufficient explosion proofness of centrifuges or decanters is achievable only by nitrogen coverage, which would entail enormous investments (sixdigit Euro figures!) for these separators.





## Water Flushing

Due to some technological and economical benefits, we prefer bio-diesel cleaning by water washing.

- + Cheapest solution
- + Best process control
- + Waste Water





- **Cheapest Solution**

Water washing is in comparison to the available dry-washing processes generally the least costly procedure of cleaning bio diesel.

We have been able to optimise the use of water to negligible quantities by continued process improvements. Compared to other concepts offered in the market, we need less than half of the water volume and thus have an accordingly reduced waste water demand.

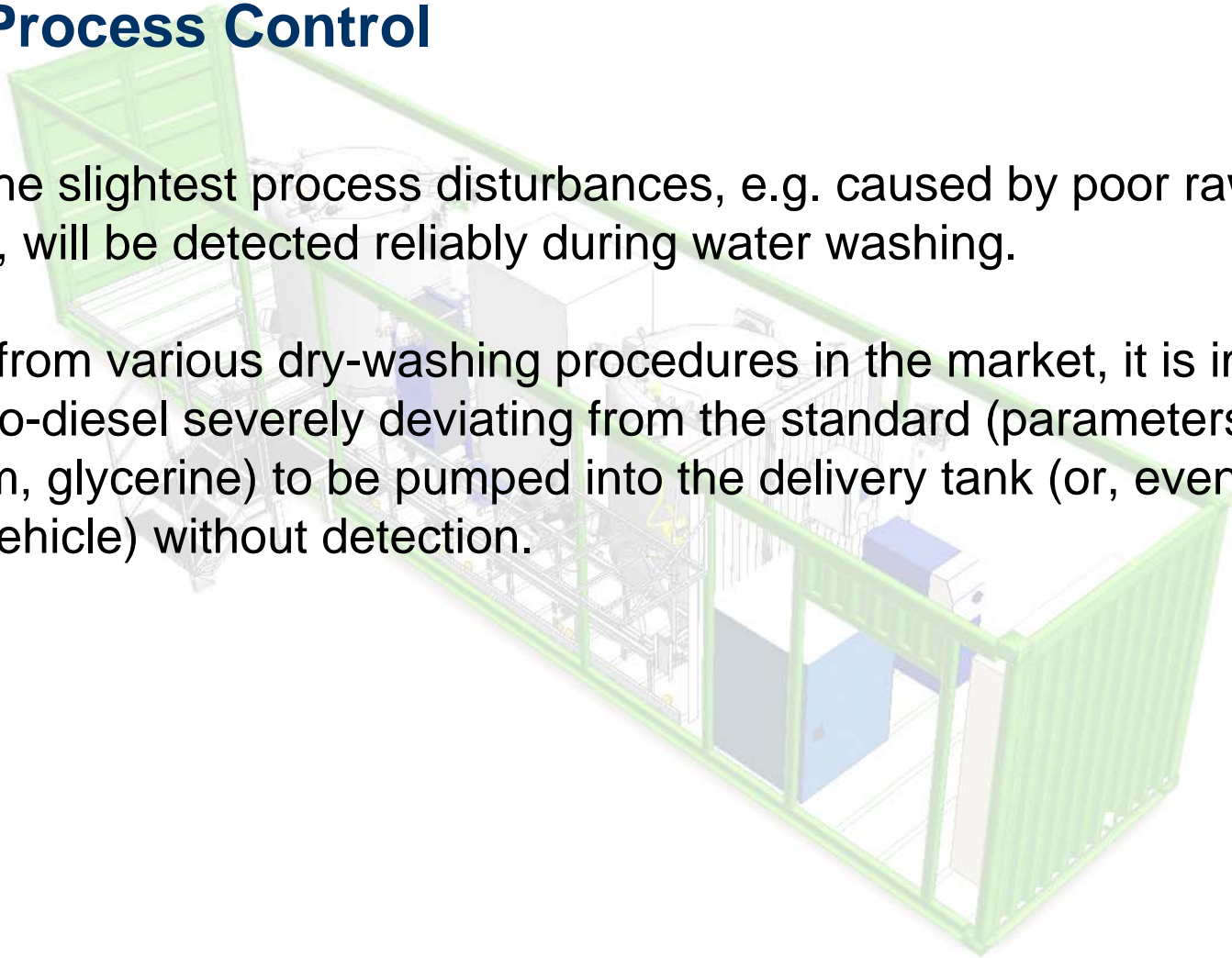
For a production of about 12,000 litres of bio-diesel per day, we use only 1,100 litres of water.



- **Best Process Control**

Already the slightest process disturbances, e.g. caused by poor raw materials, will be detected reliably during water washing.

Different from various dry-washing procedures in the market, it is impossible for any bio-diesel severely deviating from the standard (parameters: sodium, potassium, glycerine) to be pumped into the delivery tank (or, even worse, into the vehicle) without detection.



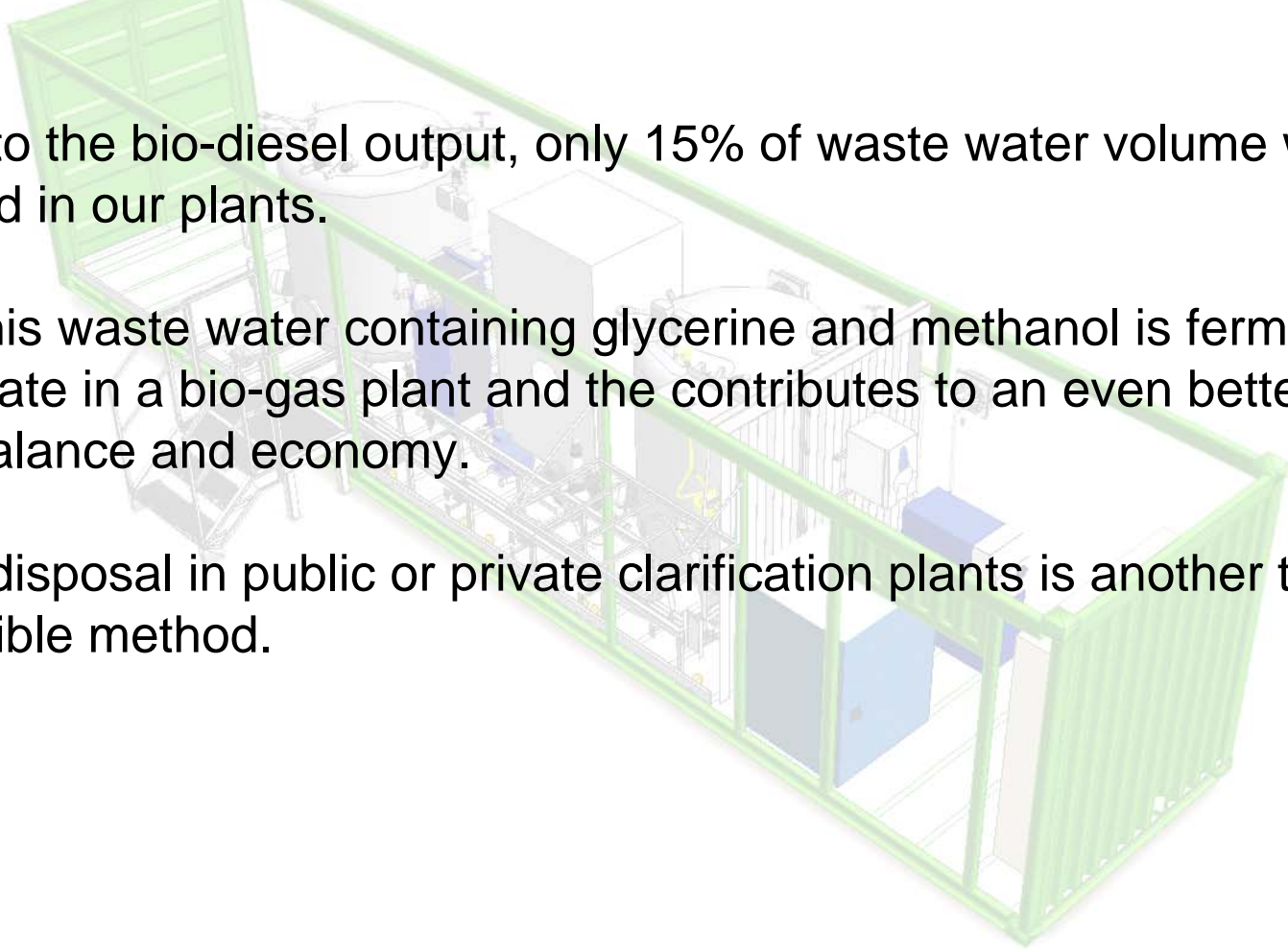


- **Waste Water Reduction**

Relating to the bio-diesel output, only 15% of waste water volume will be developed in our plants.

Ideally, this waste water containing glycerine and methanol is fermented as a co-substrate in a bio-gas plant and the contributes to an even better overall energy balance and economy.

Also the disposal in public or private clarification plants is another technically very feasible method.





## **Certified Plant Safety**

**Oecosys Plants are approved by the German TÜV and meet the strict requirements of German Emission Law. The CE Test Seal is a matter of self-evidence for us .**

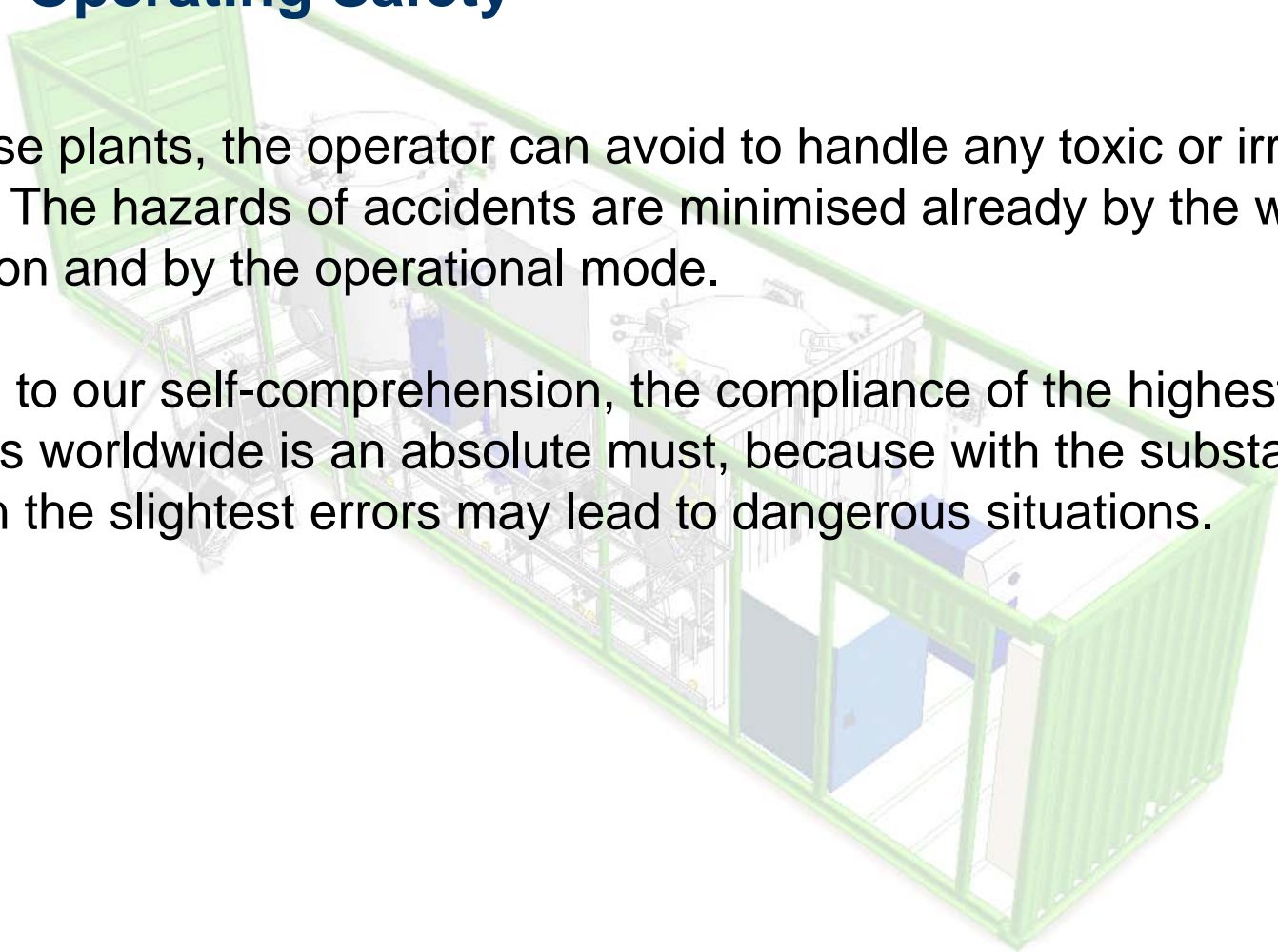
- + Higher Operating Safety**
- + Minimised Risk of total Loss (Fire, Explosion)**
- + Lower Insurance Tariffs**
- + No Problems with Approvals**



- **Higher Operating Safety**

Using these plants, the operator can avoid to handle any toxic or irritating materials. The hazards of accidents are minimised already by the way of construction and by the operational mode.

According to our self-comprehension, the compliance of the highest safety regulations worldwide is an absolute must, because with the substances used even the slightest errors may lead to dangerous situations.





- **Minimised Risk of total Loss (Fire, Explosion)**

These Plants are completely designed according to ATEX Guidelines, with means that not only ex-protected components are used, but these components are also used in the process in conformity with ATEX viewpoints.

For instance, acc. to ATEX a standard conduit of a quickly spinning agitator into the explosion-endangered gas chamber of a reactor is not permitted, since rapidly spinning metal parts may easily lead to explosions, in conjunction with minor leakages.

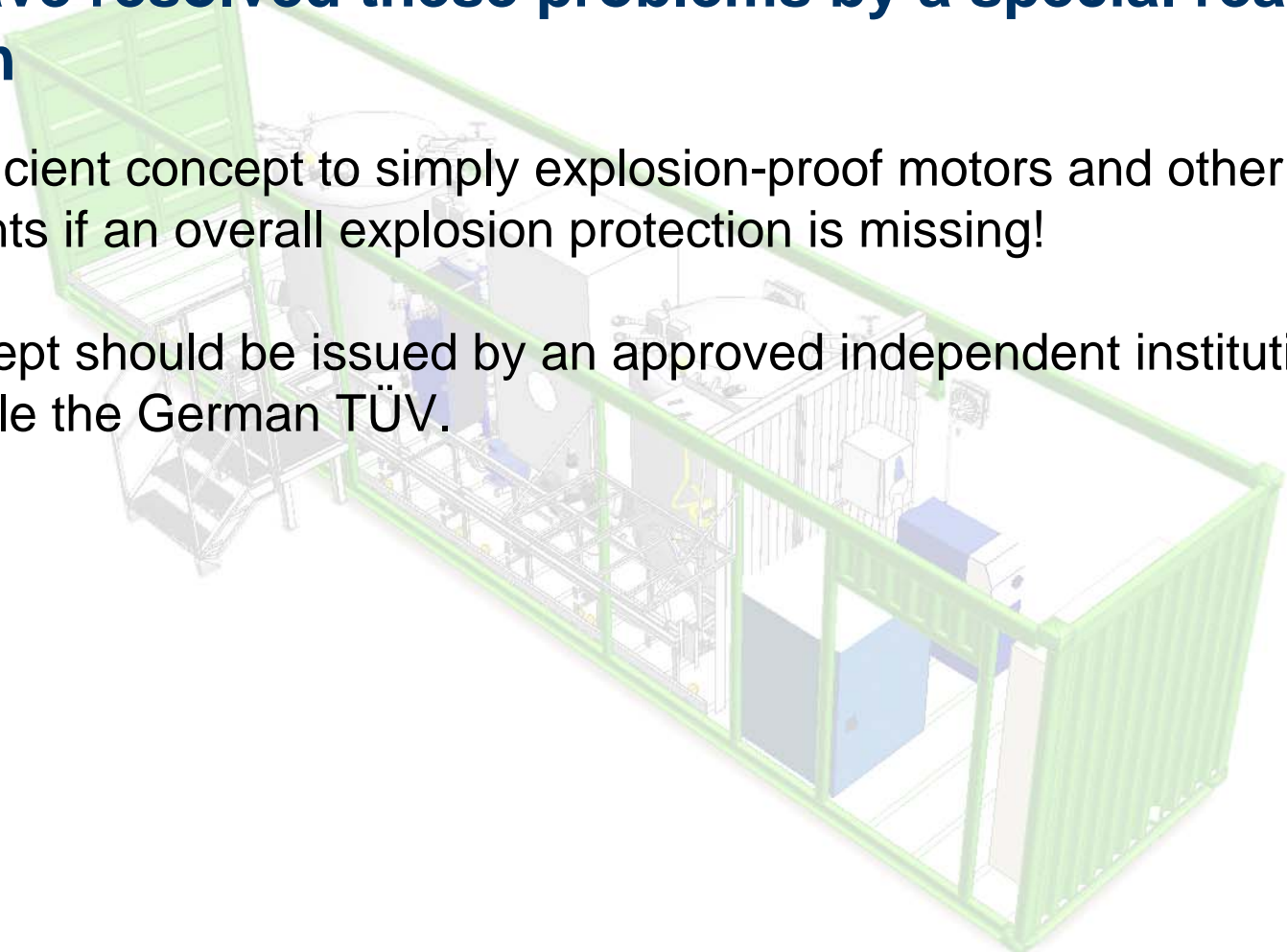
In addition, the reactor is by heated indirect because by direct heating there might develop temperatures above the ignition temperature of methanol, which would inevitably lead to fire or an explosion.



- **We have resolved these problems by a special reactor design**

Is not sufficient concept to simply explosion-proof motors and other electrical components if an overall explosion protection is missing!

This concept should be issued by an approved independent institution, like for example the German TÜV.



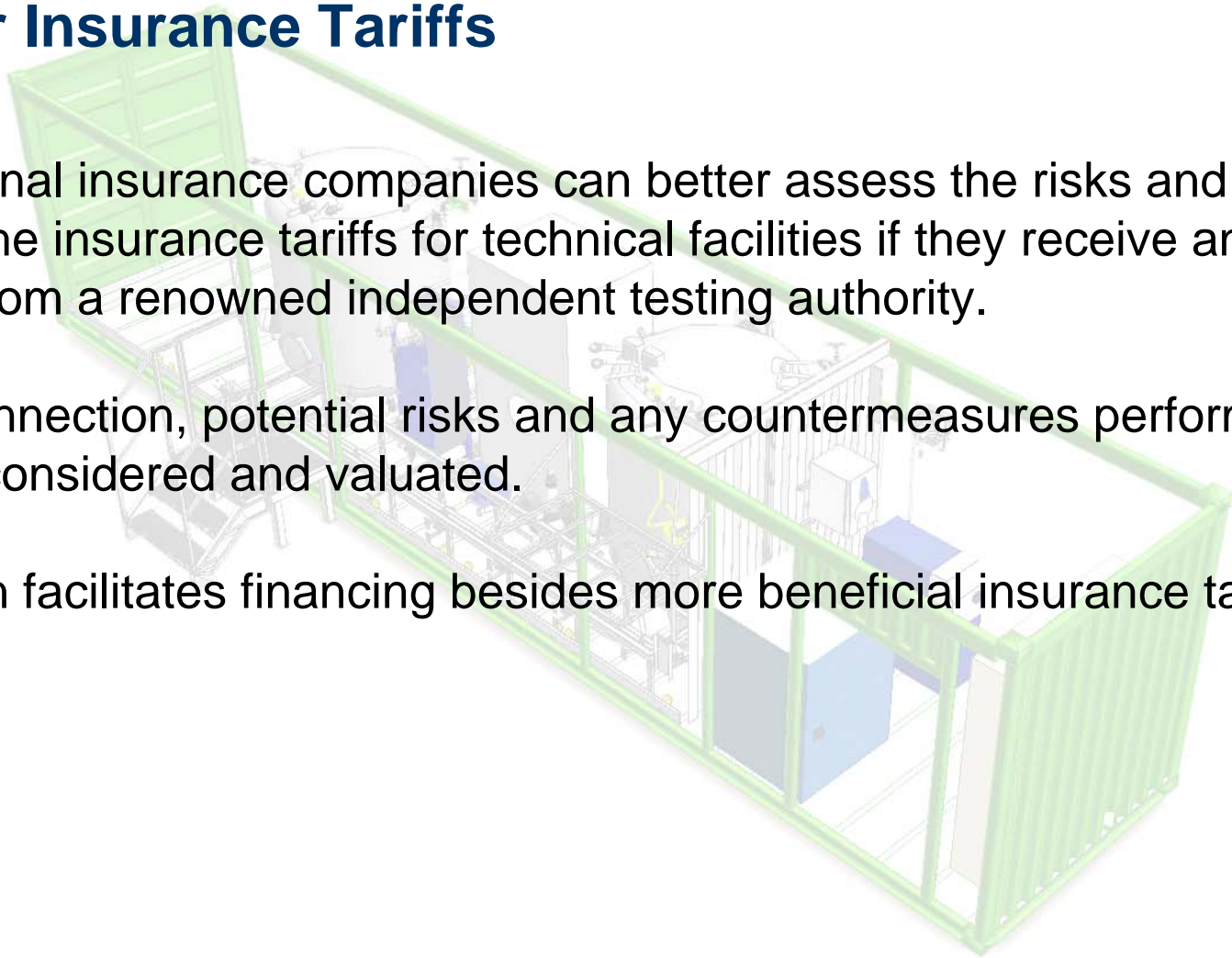


- **Lower Insurance Tariffs**

International insurance companies can better assess the risks and thereby the insurance tariffs for technical facilities if they receive an expert opinion from a renowned independent testing authority.

In this connection, potential risks and any countermeasures performed shall be considered and valuated.

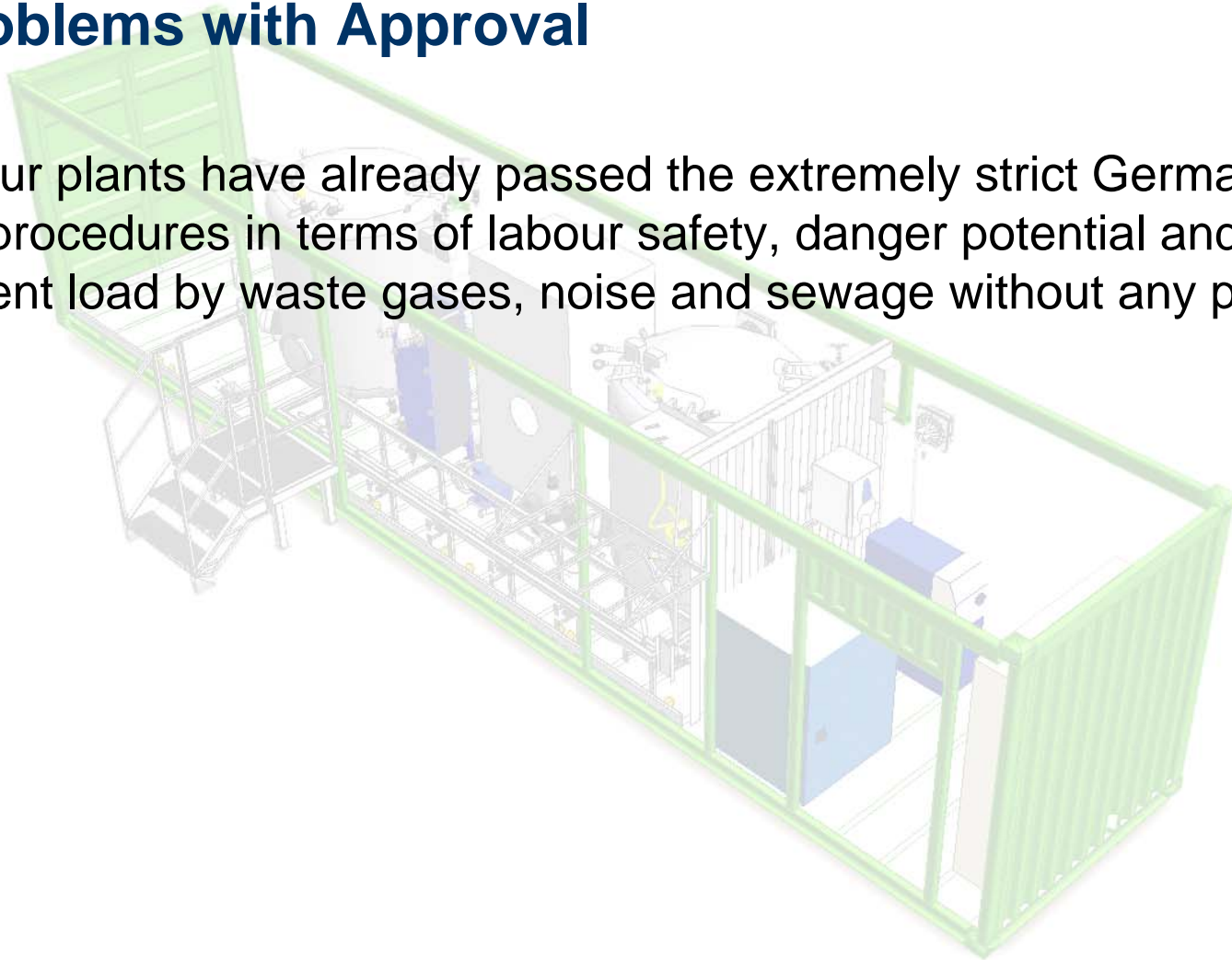
This often facilitates financing besides more beneficial insurance tariffs.





- **No Problems with Approval**

Many of our plants have already passed the extremely strict German approval procedures in terms of labour safety, danger potential and environment load by waste gases, noise and sewage without any problems.





For more information, reference plant inspections and commercial offers please call our regenerative energy department.

Thank you for your attention !



Lohrmann International GmbH  
Sonnenberger Strasse 16  
65193 Wiesbaden, Germany

Tel. +49 611 701888  
Fax +49 611 701895

[lohrmann-bioenergy.com](http://lohrmann-bioenergy.com)  
[info@lohrmann.com](mailto:info@lohrmann.com)