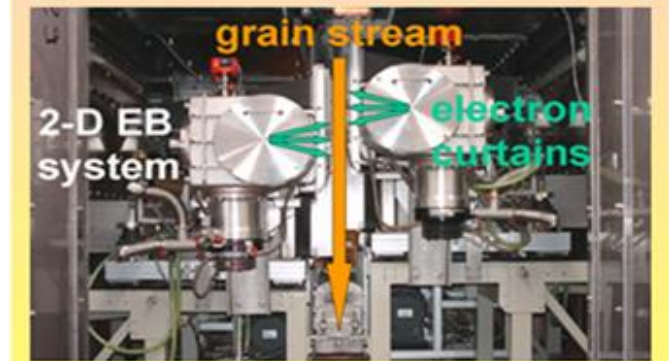
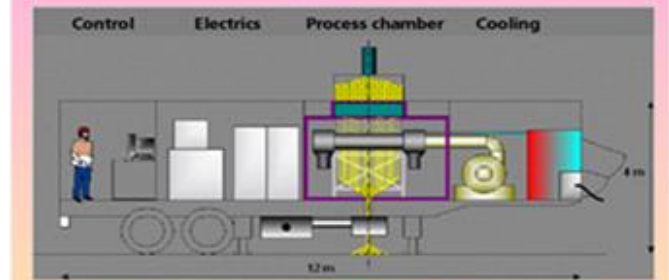
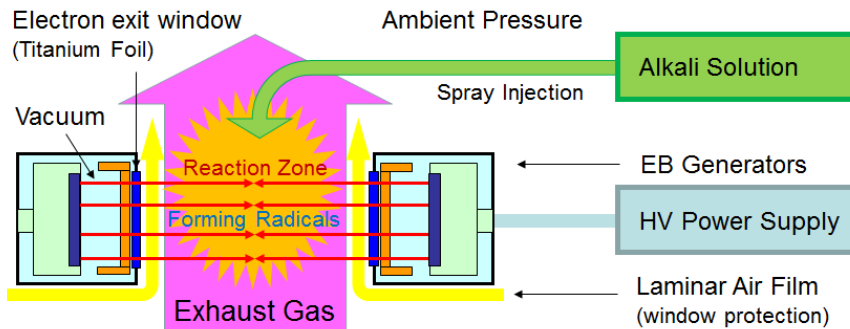
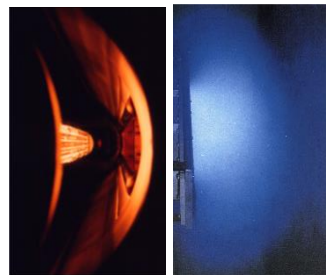


Adaptation of WESENITZ-II for Electron Beam Treatment of Ship Engine Exhaust Gas

A Brief Status Review

R. Blüthner, M. Herzog, C. Süss, G. Mattausch, FH. Rögner

ARIES-PoC Meeting, Budapest, April 09th, 2019



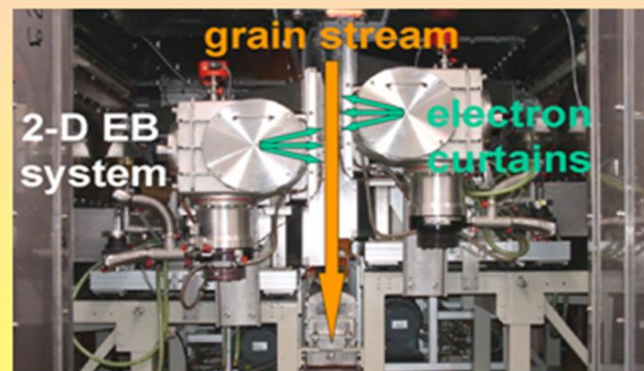
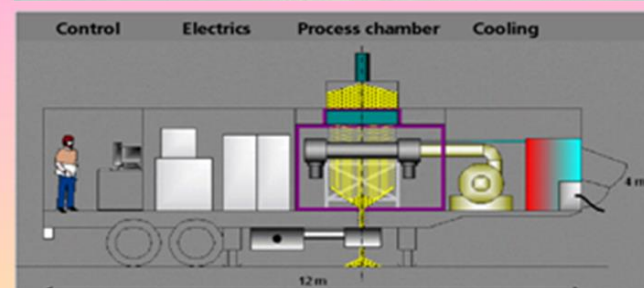
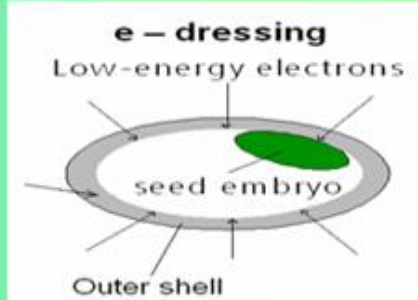
e-Dressing: Seed treatment by electrons

Physical sanitizing to stop crop diseases

Why e – Dressing ?

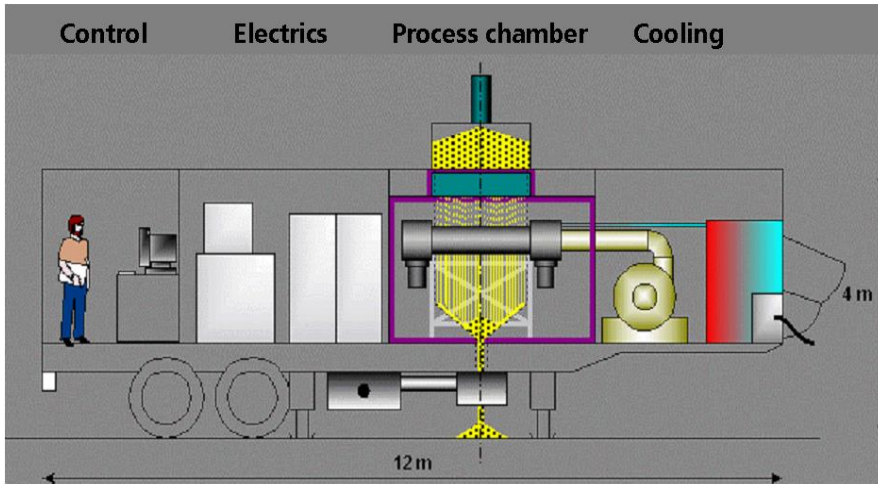
- low-energy electrons penetrate the seed coat from all sides and kill any seed-borne pathogens
- Electron energy adapted to the morphology of the seed grains
- Embryo remains unaffected
- No dressing chemicals that can be transferred into plant or soil
- Resistance phenomena impossible
- No hazard to humans and animals in case of contact with or ingestion of e-dressed seed
- No phytotoxic side effects
- Certified by the Federal Biological Office of Agriculture and Forestry

Basic Principle



Mobile e-Dressing plant WESENITZ-II

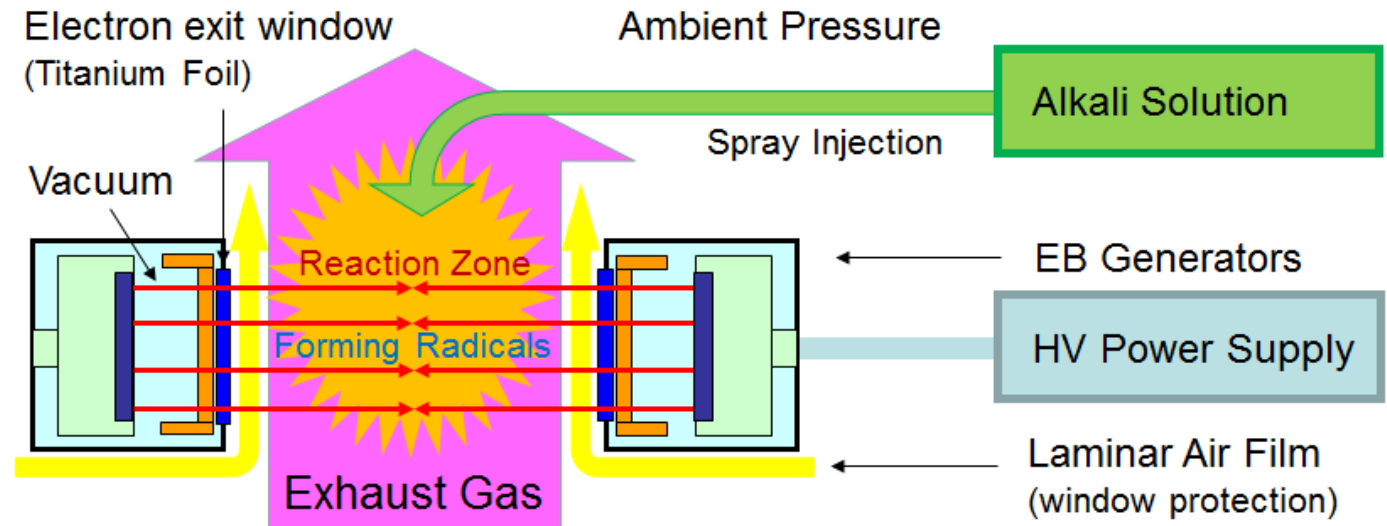
2D EB systems: 2 x 150 kV / 30 kW
 treatment width: 1 400 mm
 throughput: 30 000 kg / h
 work pressure: ambient (1 bar)



Adaptation of WESENITZ-II

From e-Dressing of Seed ...

... to Electron Beam Treatment of Ship Engine Exhaust Gas

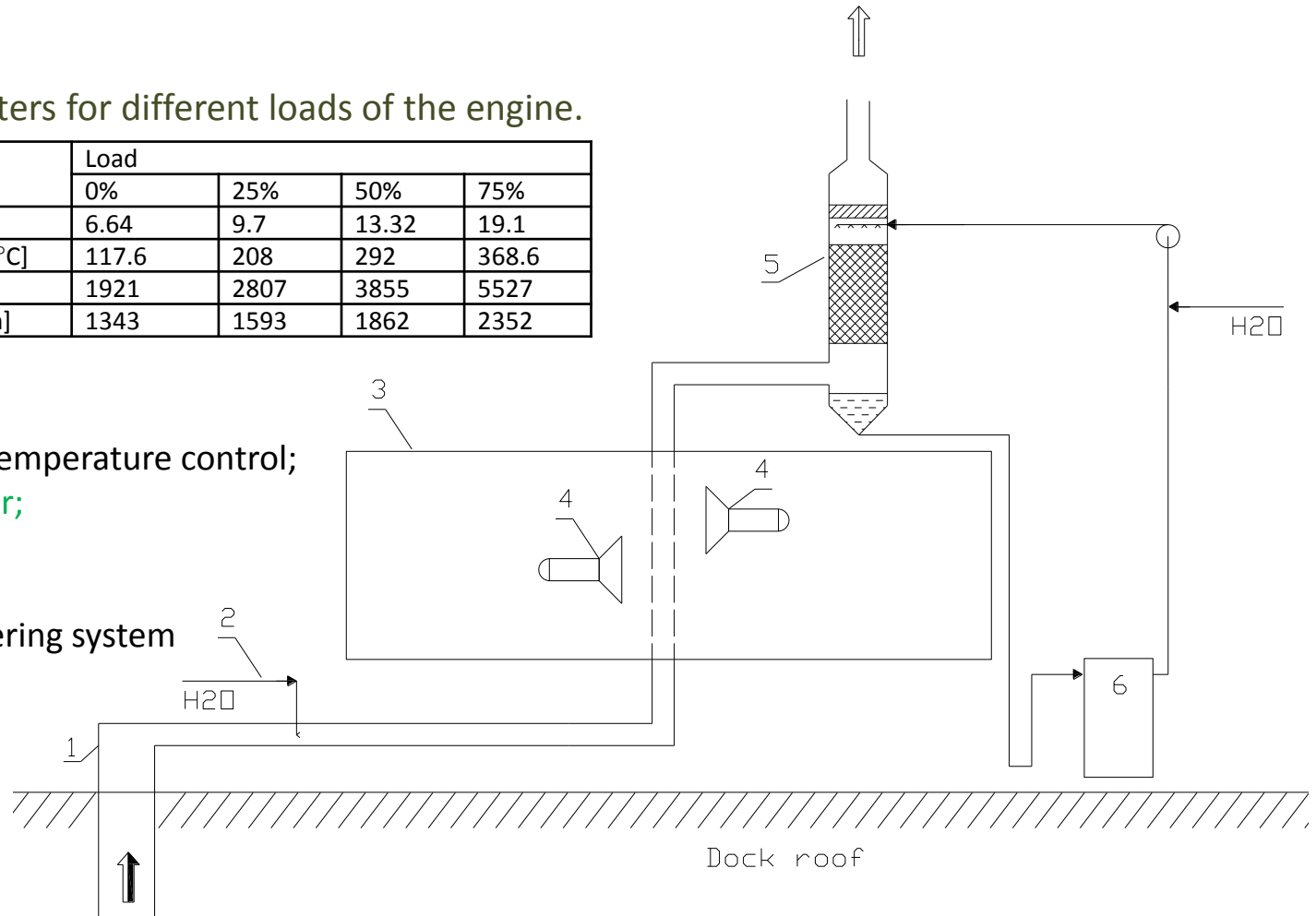


Favoured configuration for Proof of Concept: Pilot plant situated on the roof of the dock.

Main gas parameters for different loads of the engine.

Parameter	Load			
	0%	25%	50%	75%
Mean gas velocity [m/s]	6.64	9.7	13.32	19.1
Mean gas temperature [°C]	117.6	208	292	368.6
Flow rate [m ³ /h]	1921	2807	3855	5527
Normal flow rate [Nm ³ /h]	1343	1593	1862	2352

1. Stack outlet;
2. Water spraying temperature control;
3. WESNITZ-2 trailer;
4. Accelerators;
5. Scrubber;
6. Water tank / filtering system



WESENITZ-2

Principal Layout and Dimensions

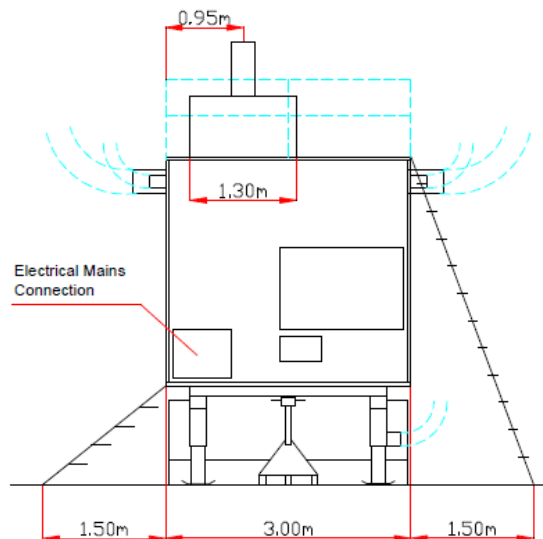
Total Weight: 30 t

Draft Version:
2019-04-08 FEP-GM

Electrical Mains Supplies:

3x 125A - 6h; 230/400V~
1x 32A - 6h; 230/400V~
Pges = ca. 100 kVA

Placement of Scrubber here - Dimensions tbd by INCT
(This draft still shows seed dressing installations)



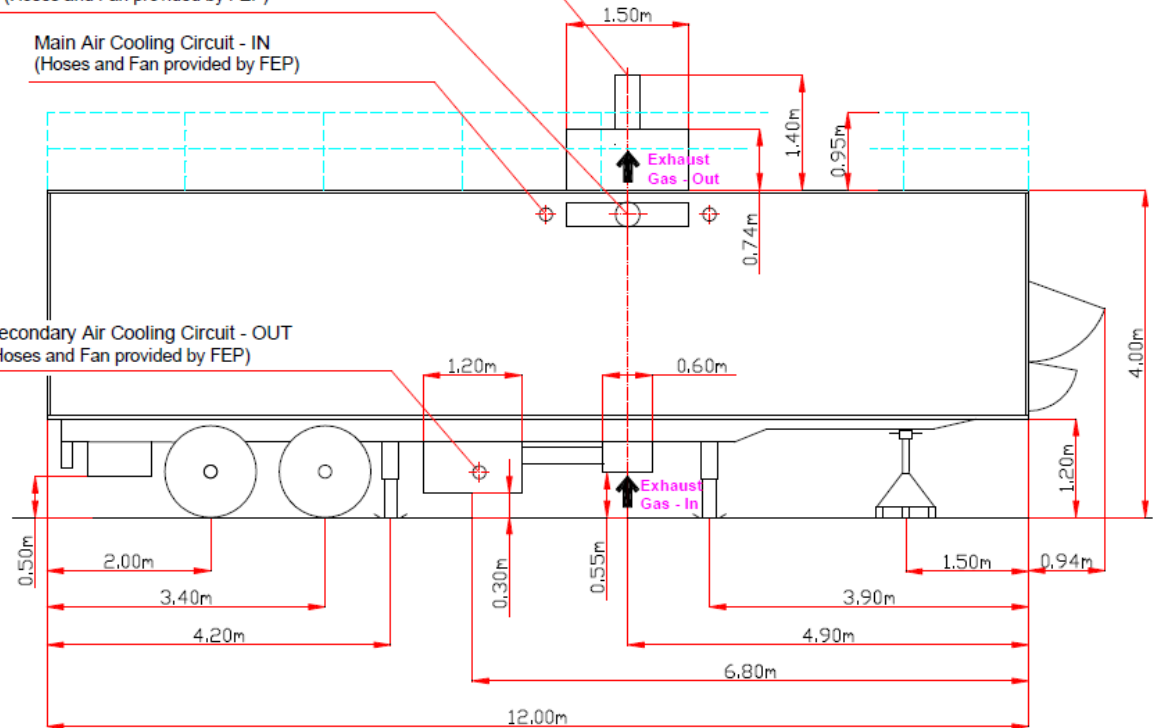
Track Gauge:

inside: 1,82 m
outside: 2,38 m

Main Air Cooling Circuit - OUT
(Hoses and Fan provided by FEP)

Main Air Cooling Circuit - IN
(Hoses and Fan provided by FEP)

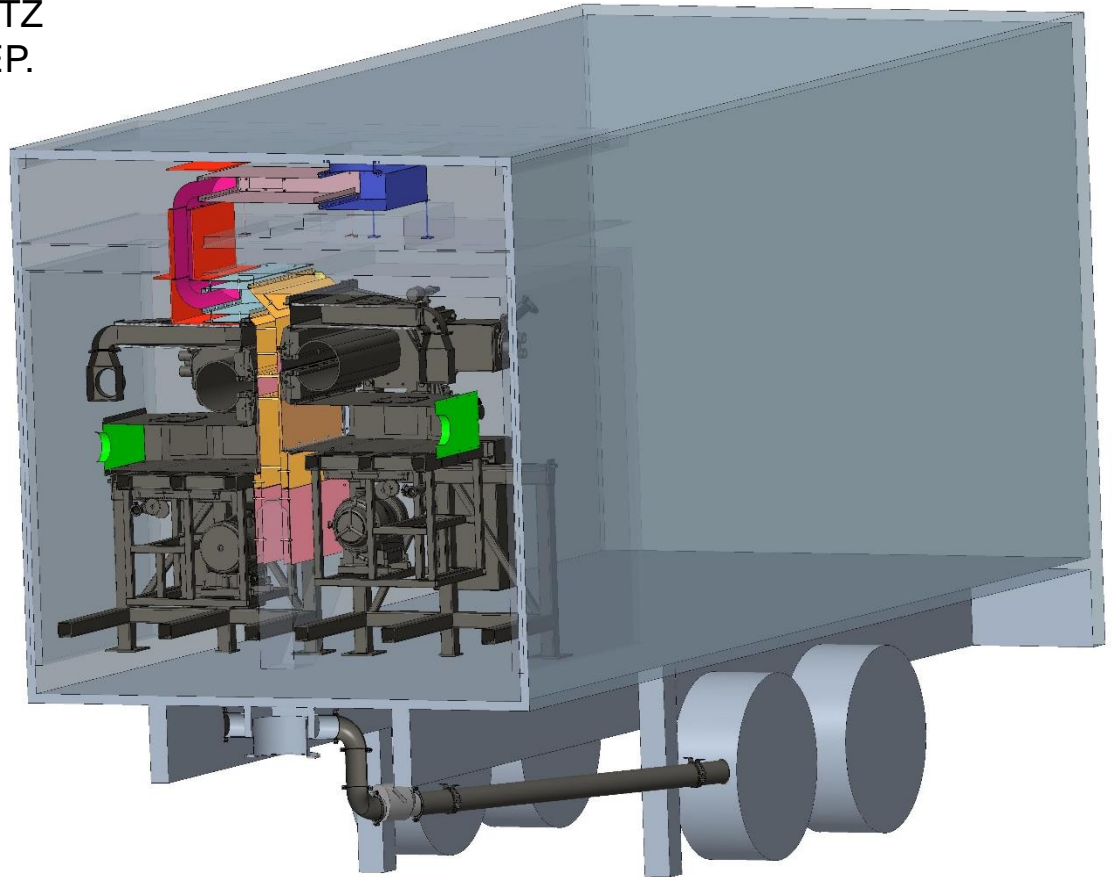
Secondary Air Cooling Circuit - OUT
(Hoses and Fan provided by FEP)



WESENITZ-2

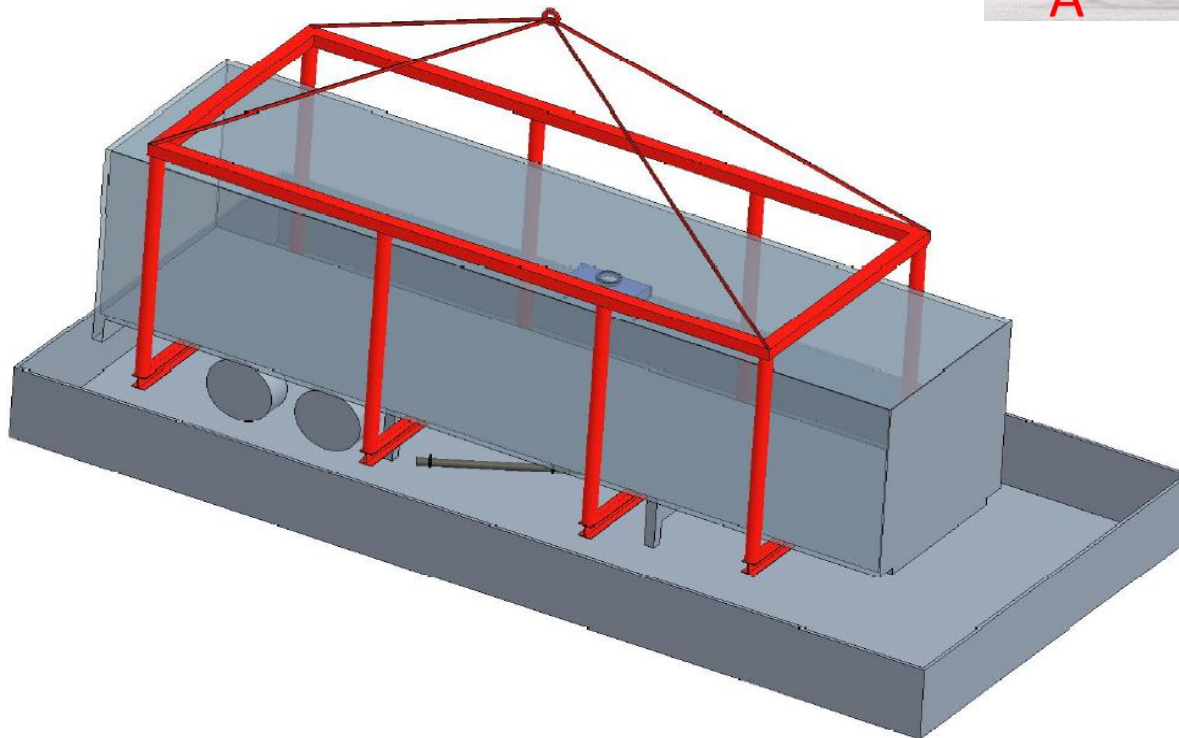
Modifications - Interfaces – Timelines for PoC „Ship Exhaust Gas Cleaning“

- Exhaust gas ducts inside WESENITZ to be designed and provided by FEP.
Manufacturing is underway.
- Interface towards chimney:
Flange NW 320 (bottom)
RTU: **Status of connecting pipes?**
- Interface towards scrubber:
Flange NW 250 (on top)
ICNT: **Status of scrubber?**
- Lifting to dock roof:
RTU: **Possible by floating crane**
RTU: **Rigging frame required.**
- Operation at dock roof:
RTU: **Service platform required**
RTU: **Electrical Mains Supply**
- All Partners: Clarification of
 - **Time schedule**
 - Technical and logistical questions



Lifting WESENITZ-2 to the dock roof: Suggested Support Positions

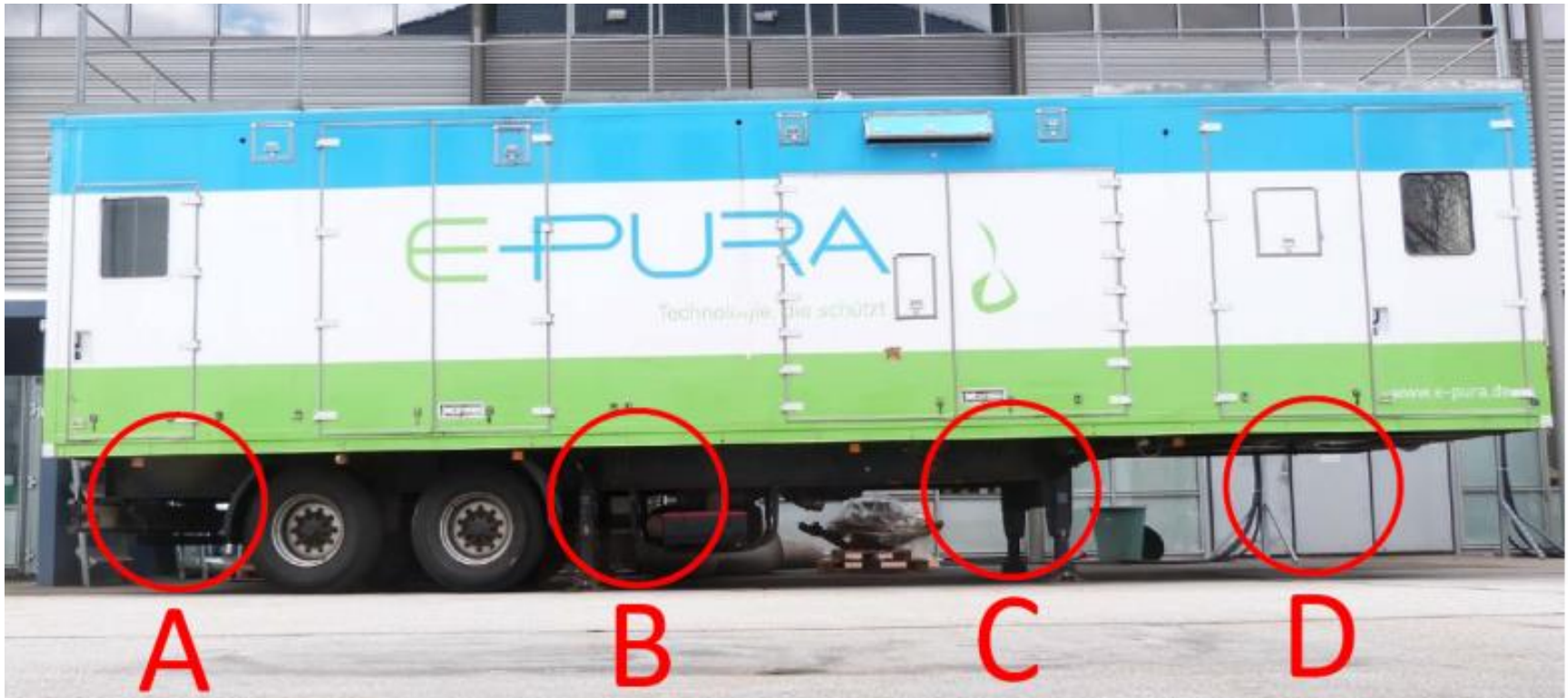
- Lifting to dock roof by floating crane confirmed by Riga Shipyard
- No force to the side walls tolerable – Rigging frame required – Status?



Proposal:
Fixing clamps under T-Beam
to connect the rigging frame

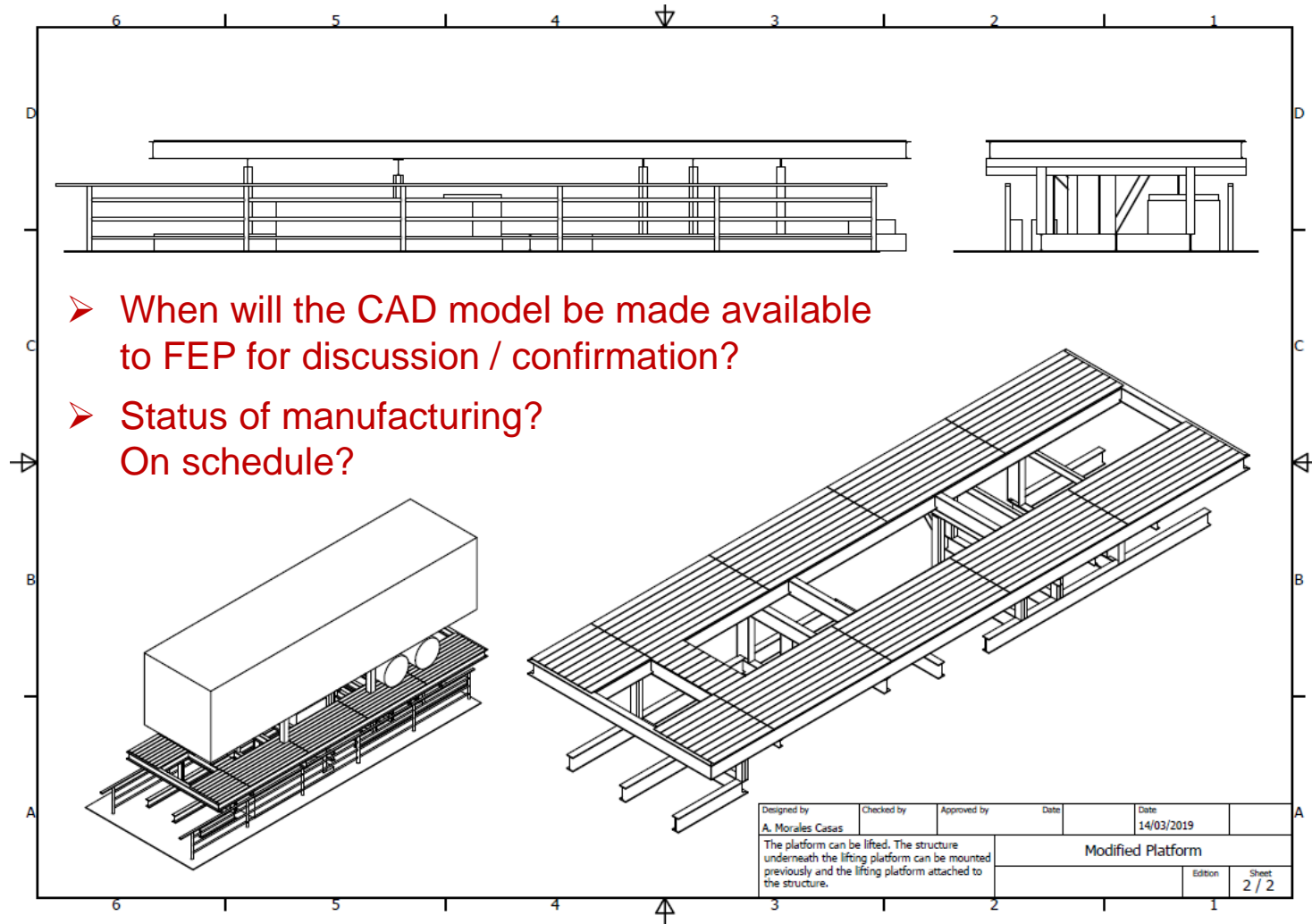


Lifting WESENITZ-2 to the dock roof: Suggested Support Positions



Operating WESENITZ-2 at dock roof: Suggested Service Platform

Designed by RTU



Operating WESENITZ-2 at dock roof:

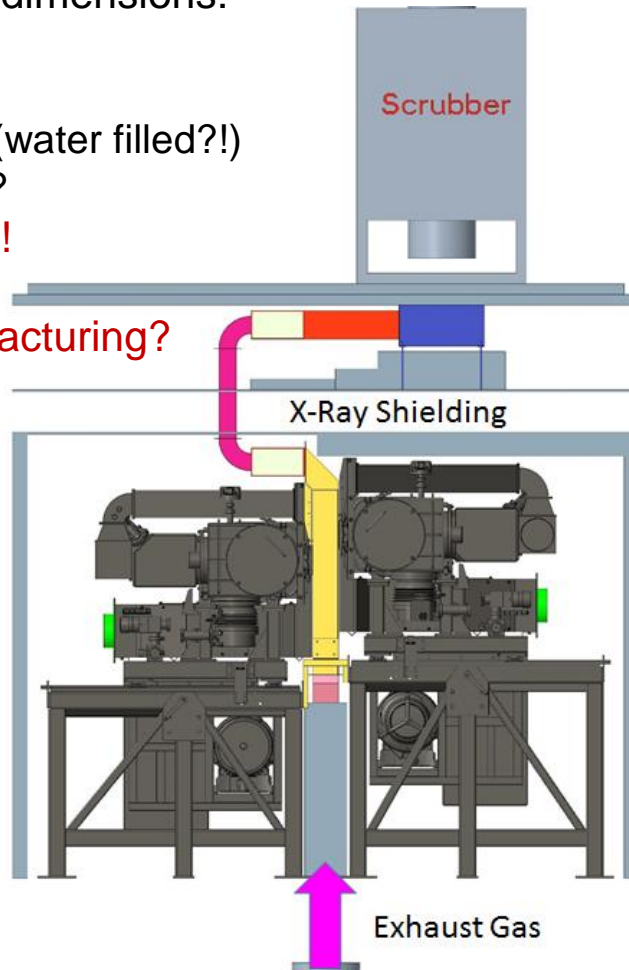
Implementation of Scrubber

Designed by INCT

- Agreed approx. dimensions:
 - foot print 1 m²
 - height 2...3 m
 - weight 500 kg (water filled?!)
 - pressure raise ?

To be confirmed!

- Status of manufacturing?
On schedule?



WESENITZ-2

Electrical Mains Supply

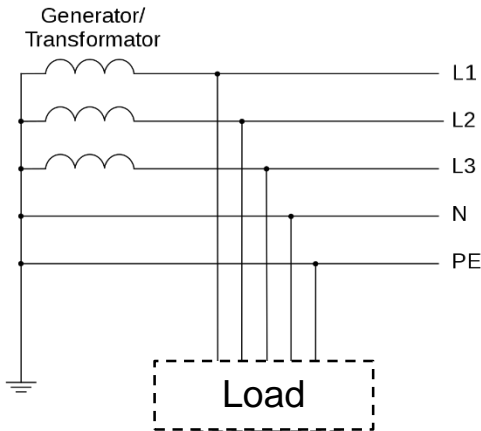
Provided by Riga Shipyard

Electrical Mains Supplies:

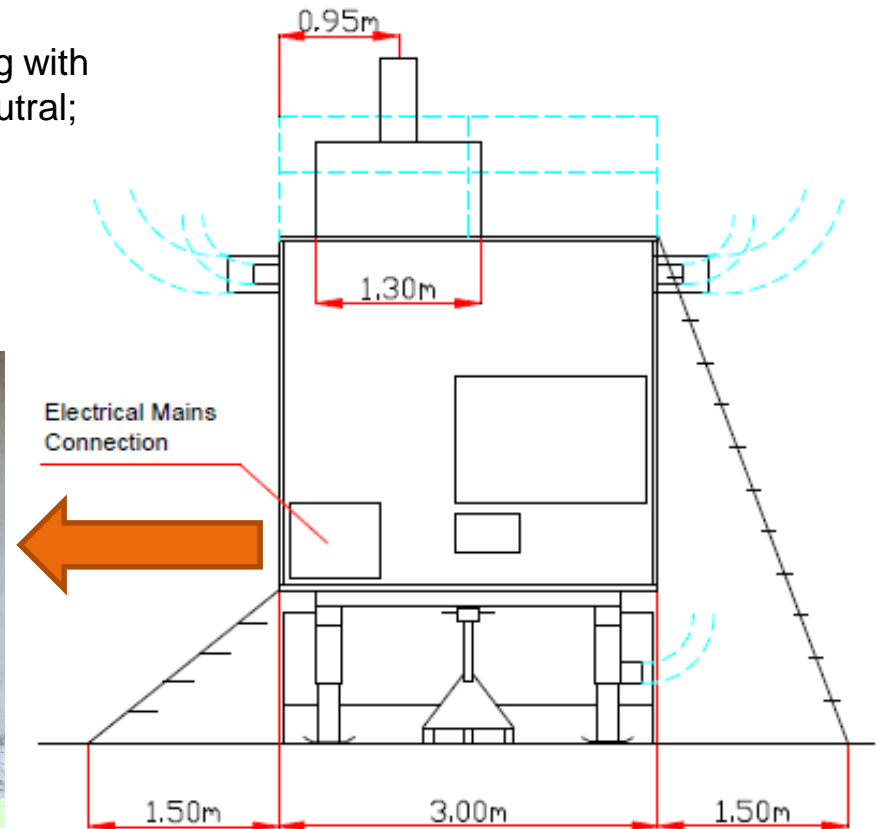
3x 125A - 6h; 230/400V~
 1x 32A - 6h; 230/400V~
 Pges = ca. 100 kVA

Confirmed and OK:

400V / 50Hz, 100A x 3 phases / plug.
 3 x CEE125A plugs; 1 x CEE32 plug



In discussion /
 To be confirmed:
 Protective grounding with
 solidly grounded neutral;
 => "TN-S system")



ARIES - PoC: Ship Exhaust Gas Cleaning by EB Treatment

Schedule suggested by FEP:

- ...week 16: Design & manufacturing of components for off-gas treatment;
Exchange of CAD Models with partners; confirmation of designs;
Uninstall seed dressing components from WESENITZ-2
- week 17...21: Install components for off-gas treatment into WESENITZ-2;
Function check of whole accelerator system at FEP
- week 22...23: Transfer of WESENITZ-2 to INCT Warszawa;
Installation and test of scrubber
- week 24...27: Transfer of WESENITZ-2 to Riga Shipyard;
Lifting to dock roof with rigging frame and placing on service platform;
Installation of exhaust gas pipes and media supplies;
Running experiments and demonstrating the cleaning effect
- week 28...32: Uninstallation of demonstrator, return of WESENITZ-2 to FEP Dresden;
Swap components back to seed dressing
- week 33...40: WESENITZ-2 to be operated in seed dressing campaign

ARIES - PoC: Ship Exhaust Gas Cleaning by EB Treatment

Questions to clarify with priority:

- Confirmation of conception for rigging frame and service platform
- Technical data of scrubber and laying of exhaust gas pipes, bypass, etc.
- Joining the CAD models of all partners; confirm timelines for manufacturing
- Necessary duration of stay at INCT Warszawa
- Plan for experiments in Riga: How many? Duration per run? Parameter ranges?
- Do we have permission from authorities to operate WESENITZ-2 in Warszawa and Riga?
- Who can manage transport of WESENITZ-2 to ICNT and Riga Shipyard (and back)?

Thank you for your attention!