Chicken or egg, what was first?

Transferring a data center design from the US to Europe and its difficulties thereby

STULZ
CLIMATE. CUSTOMIZED.

Kristian Ivkić

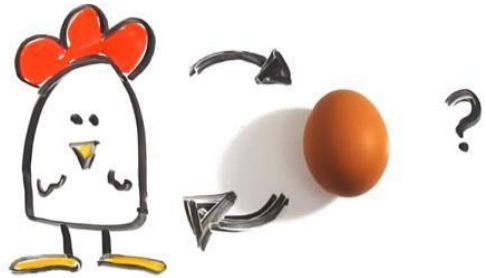
Area Sales Manager

Stulz GmbH - Germany

34 years
married, 1 daughter
Air conditioning Engineer
since 2004 at STULZ

Mail: ivkic@stulz.de
Phone: +49 40 55856087
Mobile: +49 163 8592702

Agenda



What is important for the Data Center operation from customers point of view…!

…to have an uninterruptible operation of the Data Center at minimum costs …

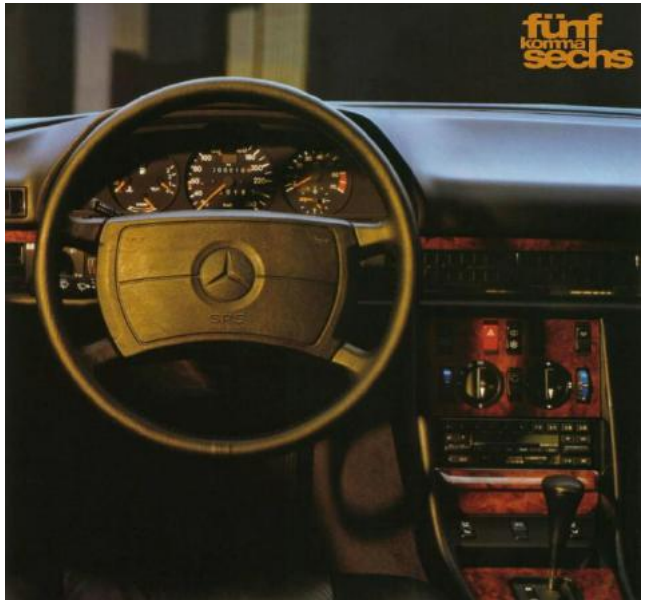
In other Words:
minimum risk & minimum cost


Every customer has it’s
own definition what
minimum risk means


Every customer has it’s own definition what minimum cost means

Minimum risk & minimum cost

Minimum risk & minimum cost



Options:

Driver Airbag	2.451,- DM
Driver and passenger Airbag	4.708,- DM

Minimum risk

safety & security level

cooling concept , system design

best possible operation conditions @ the specific location

Product / component specifications

SoO

Spare part availability

Speed of response & Aftersales Service

Manufactures competence (global and local)

Service capabilities

Minimum cost

safety & security level

cooling concept , system design

best possible operation conditions @ the specific location

Product / component specifications

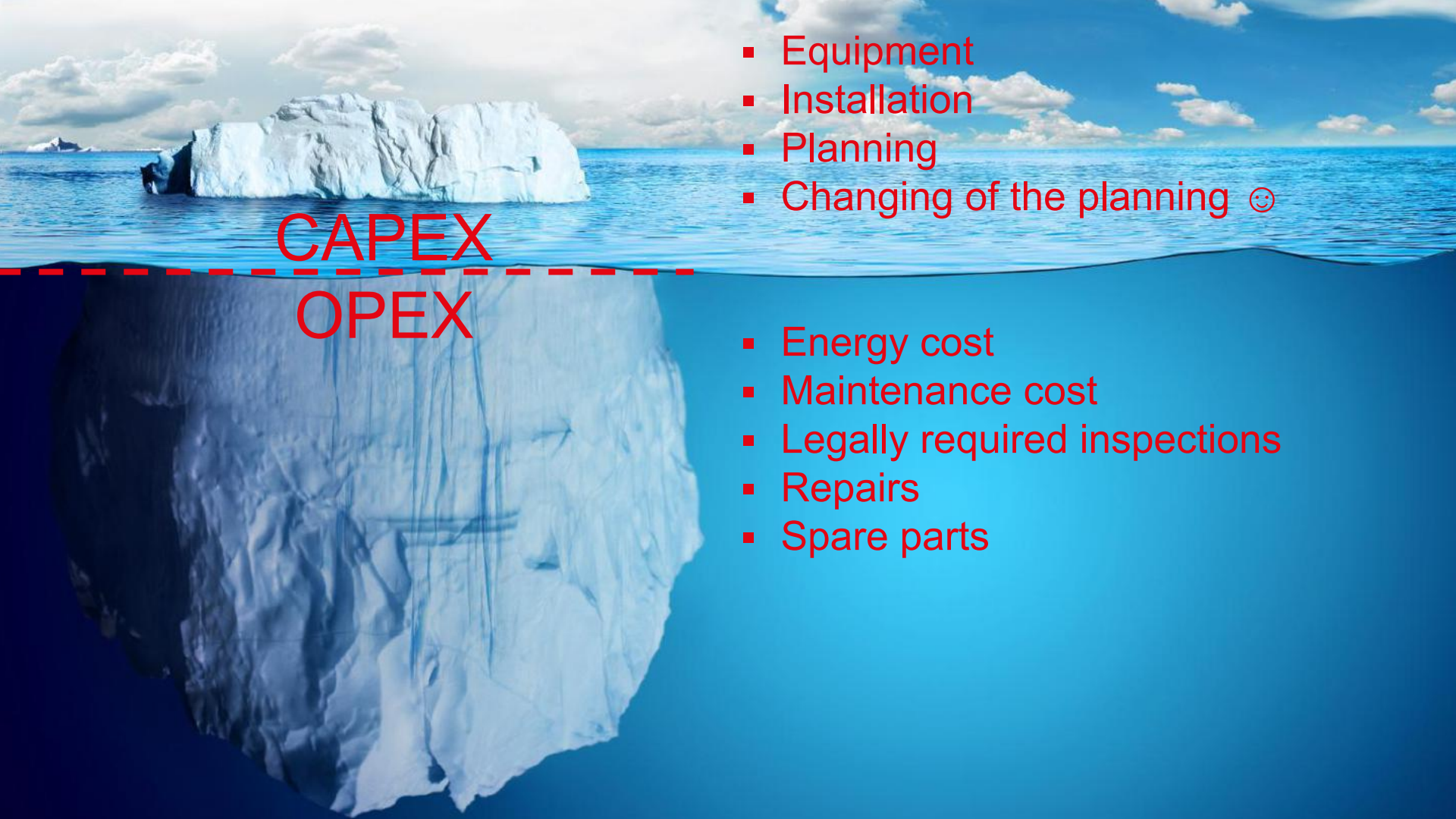
SoO

Spare part availability

Speed of response & Aftersales Service

Manufactures competence (global and local)

Service capabilities

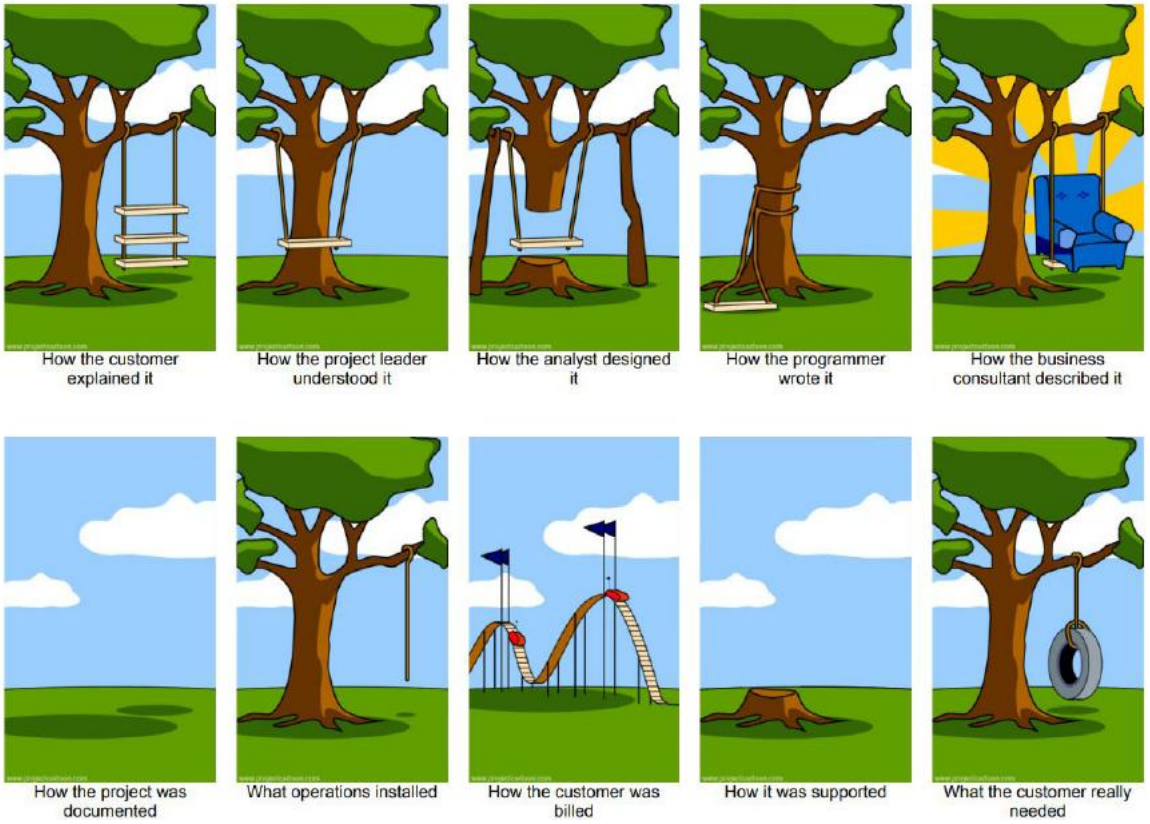


- Equipment
- Installation
- Planning
- Changing of the planning ☺

- Energy cost
- Maintenance cost
- Legally required inspections
- Repairs
- Spare parts

Minimum risk & minimum cost = customers choice

Two project stories



US customer ABC swapping over to Europe

6 Locations in 5 countries in Europe – approx. 1.000 MW

US design / condition used 1-to-1 for Europe

- XXL Down flow CRAH units
  - 400 kW
  - 108.000 m3/h
  - max. dimensions 6 x 2 meters shipped and delivered in sections
  - 1 x pipe connection
  - 1 x PICV Valve
  - 1 x controller (Carel)
  - etc.

6 Locations (5 countries)

Version 1 - best suitable version

2 x ASH 2060 CW

+ meet all technical data
- Total length 6,22 meter
- 2 x PICV Valve
- 2 x Stulz controller
- 2 x Piping connection

Unit size 7 (3.110mm)

Unit size 7 (3.110mm)

Version 2

2 x ABH 1750 CW

+/- meet all technical data
- More power consumption
- Special coil

\+ Total length 5,10 meter
\- 2 x PICV Valve
\- 2 x Stulz controller
\- 2 x Piping connection

Unit size 5 (2.550mm)

Unit size 5 (2.550mm)

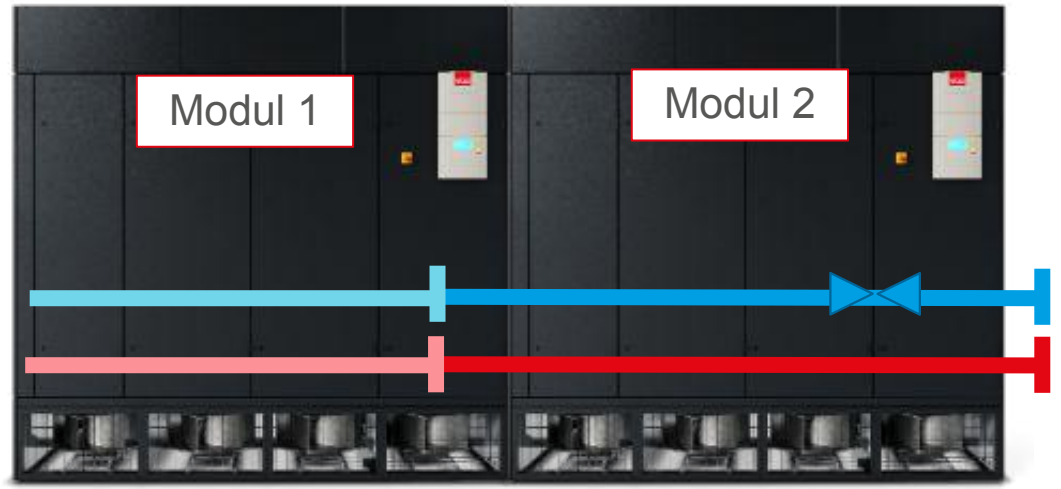
Version 3:
special design incl. first compromises

2 x ASU 2060 CW (double module unit)

\+ meet all technical data

+/- Total length 6,22 meter

\+ 1 x PICV Valve
+/- 1 x Stulz controller
\+ 1 x Piping connection



Tender phase – a few assumptions….

- Customer was opening up the design criteria during the tender phase
- We offered a special unit with special piping, 1 x large PICV (later in the Stage valves)
- Customer was asking for low prices + quick delivery times
- none of the European bidders won the tender
- the winner of the first phases was the original US supplier on which the design was based

- 6 Locations (5 countries)
- CRAH supplier
  1 Office in UK (2 x Staff)
  1 Partner Spain
- Stulz Offices
  5 Stulz Subsidiaries
  1 Partner


STULZ
22 subsidiaries
More than 140 partners worldwide
2,400 employees

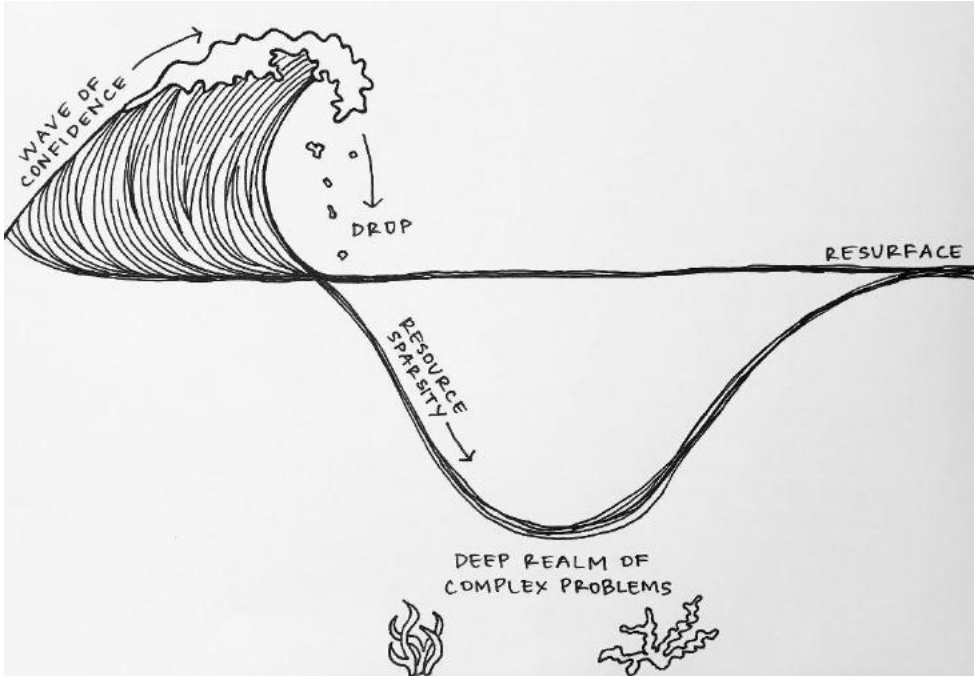
Minimum risk & minimum cost

RISK		COST
OK	safety & security level	OK
OK	cooling concept , system design	OK
OK	best possible operation conditions @ the specific location	?
OK	Product / component specifications	?
?	SoO	?
?	Spare part availability	$
?	Speed of response & Aftersales Service	$
?	Manufacturers competence (global and local)	?$?$
?	Service capabilities	$$$

Learning curve….

NOWADAYS, the customer is in deep and direct discussion with us, globally, asking us:

“What is the best possible standard solution Stulz could offer for the next phases”



US customer XYZ swapping over to Europe

2-3 Locations in Europe – total approx. 250 MW

US design / condition used 1-to-1 for Europe

- XXL Wall Flow unit
  - 380 KW
  - Air: 26°C / 38°C
  - Water 22°C / 34 °C
  - No unit size mentioned
  - 1 x pipe connection, 1 x PICV Valve

WBF2000CW @ design cooling capacity

Unit

Unit type:	WBF 2000 CW				
Cooling capacity (total):	392,8	kW	Airflow:	66.000	m³/h
Cooling capacity (sensible):	392,8	kW	Return air temperature:	45	°C
Net total cooling capacity:	380,3	kW	Return air humidity:	20	rel.%
Net sensible cooling capacity:	380,3	kW	Supply air temperature:	27	°C
EER:	31,42	kW/kW	Altitude above sea level:	0	m
AER:	0,19	W/(m³/h)	Height:	3.000	mm
Sound power level:	90,5	dB(A)	Width:	2.200	mm
LpA (2m freefield):	68,6	dB(A)	Depth:	1.660	mm
Total power consumption:	12,5	kW	Weight:	1.595	kg
			Power supply:	400V/50Hz/3Ph/N/PE	

Fan (Data per unit)

Fan type:	R3G630		Power consumption:	12,5	kW
Number:	4		ESP external static pressure:	30	Pa
Max. revolutions:	1.423	rpm	Total pressure drop:	401	Pa
Nominal power:	14,8	kW	Control voltage:	9,1	V
Revolutions:	1.366	rpm			

Hydraulics (Data per unit)

Pressure drop CW Coil:	62	kPa	Medium inlet temperature:	15,6	°C
Pressure drop 2-way valve:	79	kPa	Medium outlet temperature:	25,6	°C
Pressure drop pipework:	54	kPa	Medium volume flow:	35,1	m³/h
Total pressure drop:	195	kPa	Percentage of glycol:	20	%
			Type of Medium:	Ethylenglycol	
			Nominal size 2-way valve:	DN50	

Information with the option "Unit with filter M5"!

WBF2000CW @ design water conditions

Unit

Unit type:	WBF 2000 CW		Airflow:	66.000	m³/h
Cooling capacity (total):	207,5	kW	Return air temperature:	41	°C
Cooling capacity (sensible):	207,5	kW	Return air humidity:	22	rel.%
Net total cooling capacity:	195,1	kW	Supply air temperature:	32	°C
Net sensible cooling capacity:	195,1	kW	Altitude above sea level:	0	m
EER:	18,73	kW/kW	Height:	3.000	mm
AER:	0,19	W/(m³/h)	Width:	2.200	mm
Sound power level:	90,5	dB(A)	Depth:	1.660	mm
LpA (2m freefield):	68,6	dB(A)	Weight:	1.595	kg
Total power consumption:	12,4	kW	Power supply:	400V/50Hz/3Ph/N/PE	

Fan (Data per unit)

Fan type:	R3G630		Power consumption:	12,4	kW
Number:	4		ESP external static pressure:	30	Pa
Max. revolutions:	1.423	rpm	Total pressure drop:	401	Pa
Nominal power:	14,8	kW	Control voltage:	9,2	V
Revolutions:	1.371	rpm			

Hydraulics (Data per unit)

Pressure drop CW Coil:	11	kPa	Medium inlet temperature:	20,5	°C
Pressure drop 2-way valve:	13	kPa	Medium outlet temperature:	33,5	°C
Pressure drop pipework:	10	kPa	Medium volume flow:	14,3	m³/h
Total pressure drop:	34	kPa	Percentage of glycol:	20	%
			Type of Medium:	Ethylenglycol	
			Nominal size 2-way valve:	DN50	

Information with the option "Unit with filter M5"!

Tender phase – a few assumptions….

- We’ve informed the customer that the combination of cooling capacity and water/air conditions is not reachable with our Wall flow units
- We’ve asked for the max. dimensions
- Tender was stopped after this conversation
- t.b.c.

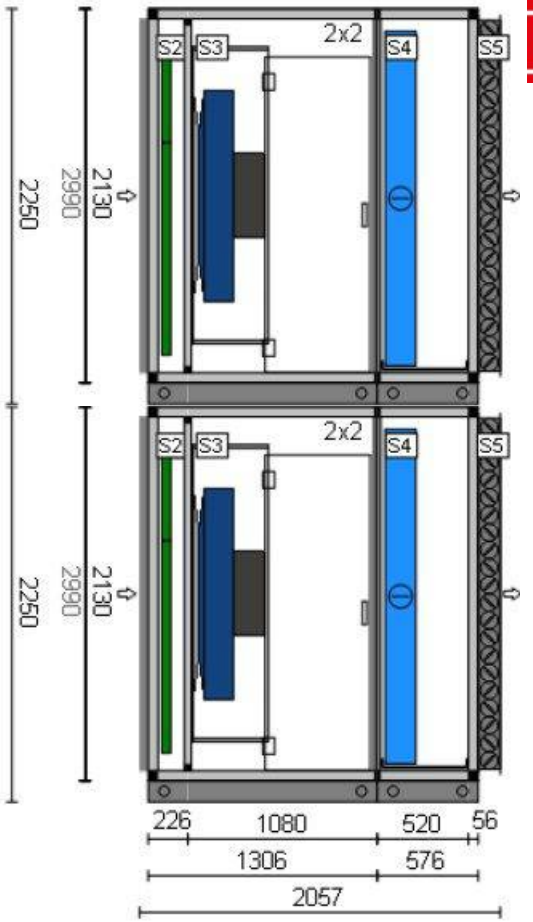
Learning curve…!

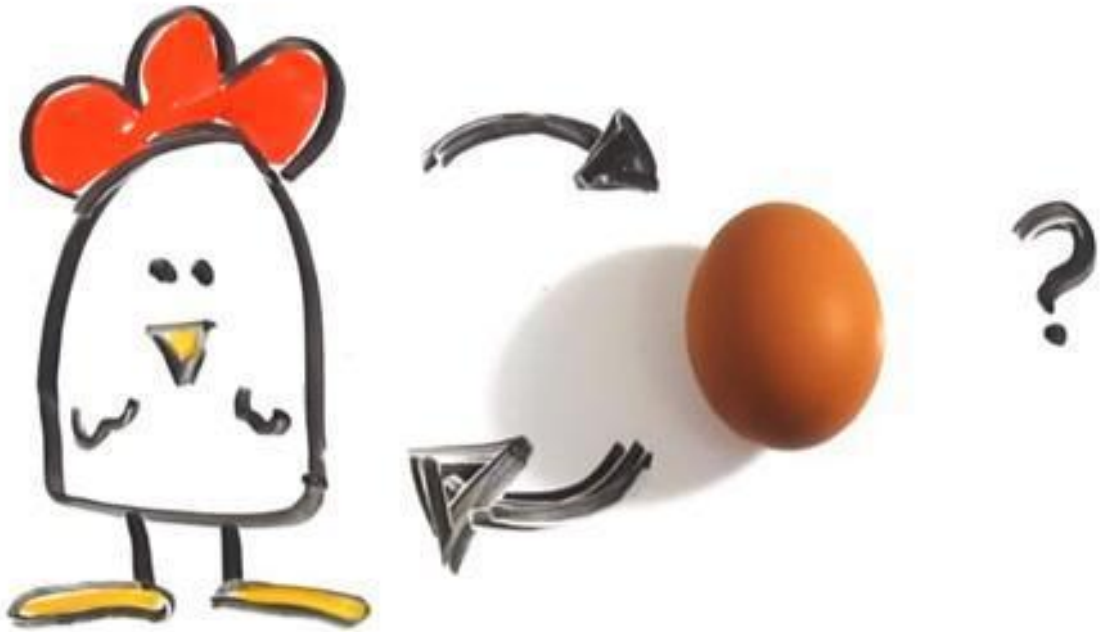
NOWADAYS, the customer is in deep and direct discussion with us, globally, asking us:

“What is the best possible customized solution Stulz could offer for the project”

Given dimensions 4,5 m x 2,1 m x 2,25 m

- Sensible capacity 430 kW
- Air: 23°C / 41°C
- Water 21°C / 33 °C

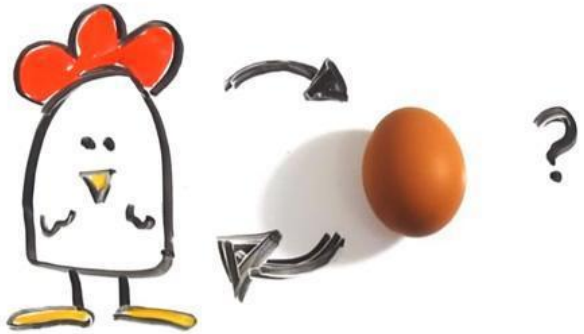




Chicken - Egg dilemma - what comes first the design or the product?

Chicken - Egg dilemma

- During the design stage a strategic choice will be made
- Whatever will be decided on availability, technology, budget, service etc., has a direct impact on what the customer will get.
- Risk and Cost factors have a inversely proportional impact on each other
- Deep and detailed Knowledge can reduce both



Product competence – CyberAir 3 PRO

Unit size 1
(950mm)

Unit size 2
(1.400mm)

Unit size 3
(1.750mm)

Unit size 4
(2.200mm)

Unit size 5 (2.550mm)

Unit size 7 (3.110mm)

Unit size 8 (3.350mm)

Product competence – CyberAir 3 PRO

ASD - ASU

H = 1.980mm

D = 890mm (BG1-5)
D = 980mm (BG7)

ASR - ASH

H = 2.495mm

D = 890mm (BG1-5)
D = 980mm (BG7-8)

ABR

H = 2.915mm

D = 1.040mm

Product competence – CyberAir 3 PRO

ASD - return air from top - supply air through bottom into raised floor

ASU - return air from front - supply air to top - (return air from bottom as an option)

Product competence – CyberAir 3 PRO

ASR, ABR - return air from top - supply air through fan section to front, bottom and rear side under the raised floor

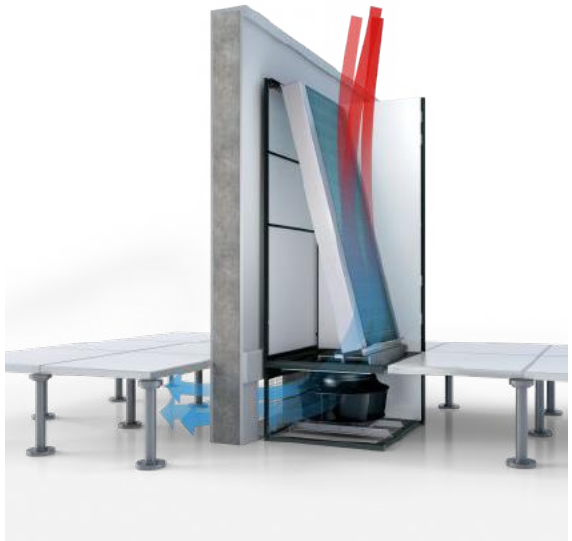
ASH - return air from top - supply air through bottom (fan section) into raised floor

Product competence– CyberAir 3 PRO

ASR, ABR - return air from top - supply air through fan section to front under the raised floor, bottom and rear side closed

ASH - return air from top - supply air through fan section to front above the raised floor

Product competence – CyberAir 3 PRO



ASR, ABR - return air from top - supply air through fan section to rear under the raised floor, bottom and front side closed

ASR, ABR - return air from top - supply air through fan section to front and bottom under the raised floor, rear side closed

Product competence - CyberWall

- **Highest efficiency through smart component arrangement**

- Radial fan is blowing through the CW coil
- Free air intake of the fan
- Low pressure losses inside the unit due to large filter dimensions and coil surface

Product competence - Custom AHU (samples)

Product competence - Custom AHU (samples)

Product competence – options & customizing

Operational safety/transparency options:

- Dual power supply
- Water/Fire/Smoke sensors
- UPS-buffered controller
- Differential pressure control
- Supply air and delta T control
- Calculation/display of airflow, cooling capacity and EER
- Connection to BMS systems

Hydraulic options:

- Pressure independent control valves
- Different possibilities of pipework connections

Free Cooling options:

- FCP (FreeCool Plenum) for Direct Free Cooling
- DFC (Indirect Dynamic Free Cooling) for CW2

Customized Options:

- Custom Coils, valves, piping, hydraulic components
- Custom unit sizes
- Custom Controls, electrical options

Global & Local know-how

11 production plants

22 subsidiaries

More than 140 partners worldwide

2,400 employees

Turnover 450 million euros

Global & Local know-how

Global & Local know-how

- Stulz KAM Team - global coordination, customer specific requirements
- Stulz Cloud application team - Cooling concepts, special designs
- Business unit chiller - Chiller / hydraulic concepts
- Stulz network 11/22/140 - worldwide country specific knowledge
- Service - worldwide factory certified technicians

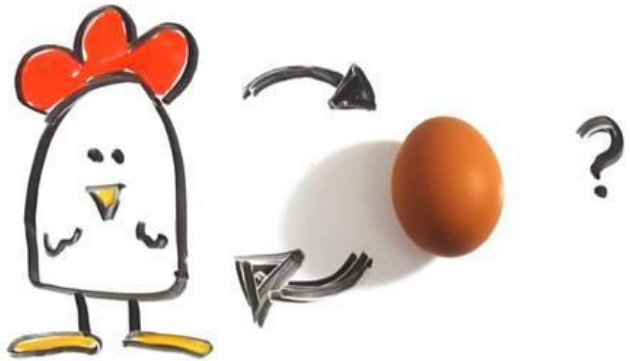
– planning – implementation – commissioning –
– support – service – callouts – experience –

Global & Local know-how

RISK		COST
	safety & security level	
	cooling concept , system design	
	best possible operation conditions @ the specific location	
	Product / component specifications	
	SoO	
	Spare part availability	
	Speed of response & Aftersales Service	
	Manufactures competence (global and local)	
	Service capabilities	

Bonus slide ?

Air Conditioning retrofit for armored military vehicles



THE WHOLE RANGE OF COOLING. FROM ONE SINGLE SOURCE.