Kotlovi i logistika biomase - praktično znanje

Boilers and biomass logistic – practical knowledge

17.1.2017.

Povijest od HERZ

Kvaliteta i inovativnost već 120 godina

Povijest HERZ – grupacije vodi nas u 1896. godinu, u ulicu Herzgasse u Beču, kada su osnivačke obitelji Gebauer i Lehrner započeli s proizvodnjom armatura.

Ta prva adresa – Herzgasse – tako je dala i ime današnjoj HERZ - grupaciji

The history of HERZ

Quality and innovations since 120 years

The history of HERZ starts in the year **1896**, in the „HERZgasse“ in „Wien-Favoriten“ where the **families Gebauer and Lehrner** started with the production of valves.

The company HERZ is named after the first address – **“HERZgasse”**.

The “HERZgasse” was named after Dr. Rudolf HERZ, a benefactor to the poor inhabitants of Vienna.

Ciljevi i strageija HERZ

Vlasnik: Dr. Gerhard Glinzerer

- Neovisna tvrtka
- Kontinuirani rast
- Međunarodna najviši položaj
- potpuni dobavljač u sektoru grijanja
- razvoj i unapređenje proizvoda
- ekološko i ekonomsko promišljanje

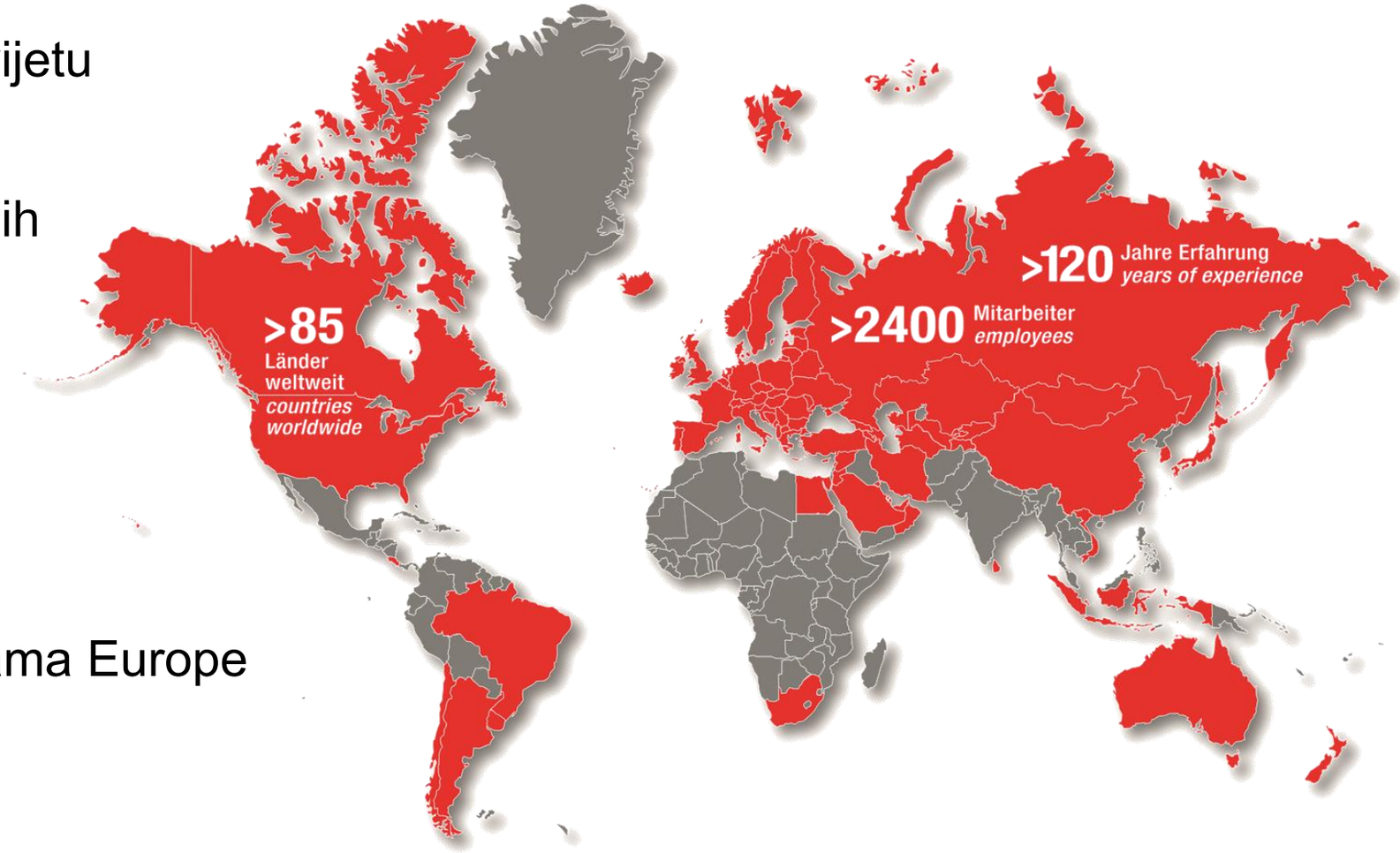
Aims & strategy of HERZ

Owner: Dr. Gerhard Glinzerer

- independent company
- continuous growth
- international top position
- complete supplier in the heating sector
- development and improvement of products
- ecological and economic thinking

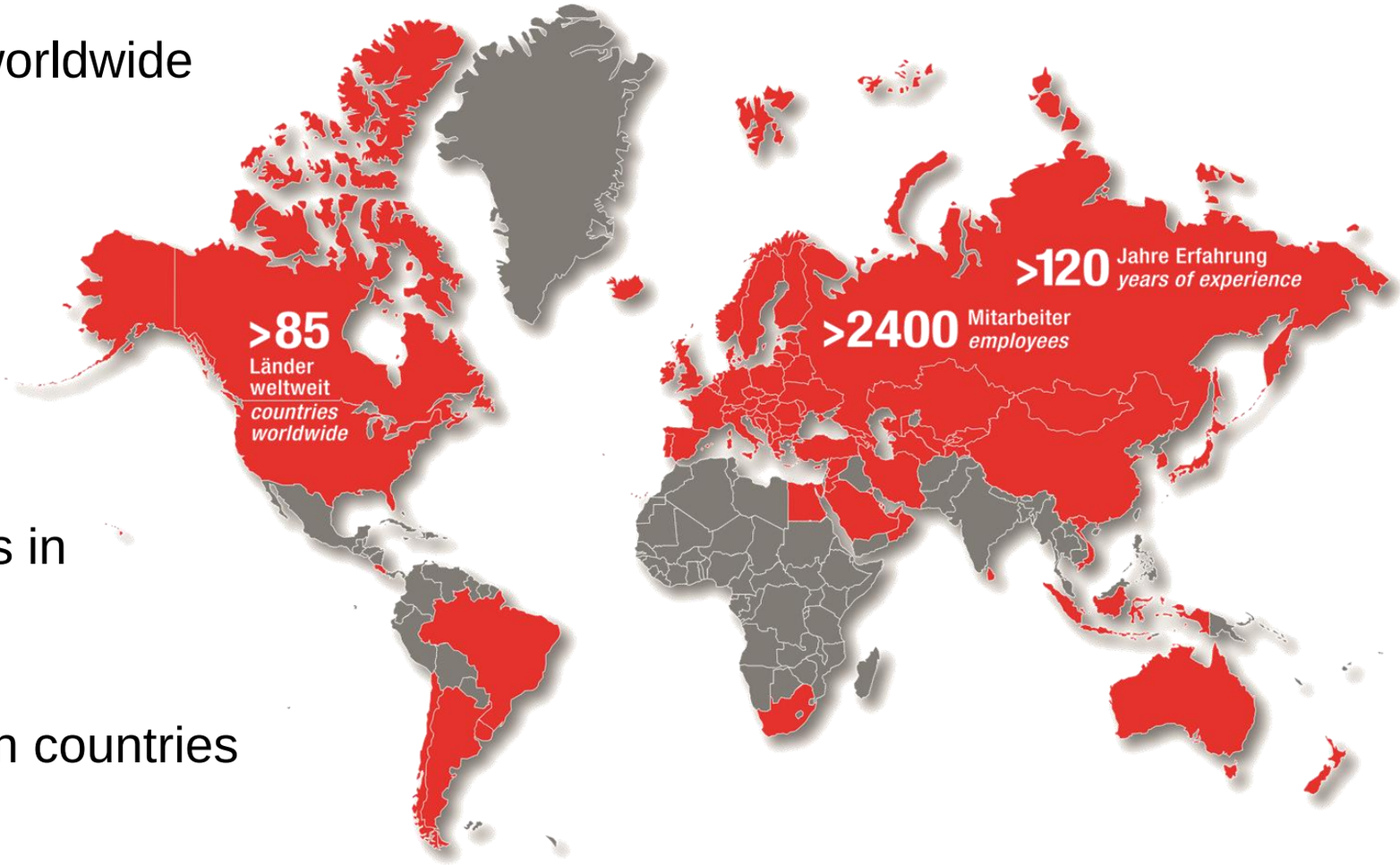
The HERZ-group

- **120**-godina na tržištu
- preko **85** država u svijetu
- preko **2500** zaposlenih
- **260** Mio. € promet
- **22** tvornice u Europi
  – 8 u Austrij
  – 14 u drugim državama Europe
- **75%** izvoza
- **22** tvrtke kćeri



The HERZ-group

- **120**-years present on the market
- in over **85** countries worldwide
- over **2500** employees
- **260** Mio. € turnover
- **22** production facilities in whole Europe
  - 8 in Austria
  - 14 in other european countries
- **75%** export ratio
- **22** subsidiaries



HERZ struktura grupacije

HERZ grupacija

- ventili

- biomasa
- dizalice topline

- EPS Tehnologija

- do 1000 kW

- preko 1000 kW

The group structure

The HERZ group

- valves
- control technology

- biomass
- heat pumps

-EPS insulation
- packaging material

- up 1000 kW

- over 1000 kW

Proizvodni pogoni

8 proizvodnih pogona u Austriji

- Beč

- Rohrbach (IPA)

- Glanegg (Hirsch)

- Pinkafeld

- Kemeten

- Sebersdorf

- Bärnbach (Binder)

- Salzburg (Universa)

14 proizvodnih pogona u drugim državama

- Poljska (3)
- Srbija
- Mađarska (3)
- Češka
- Rumunska (2)
- Slovenija
- Slovačka (2)
- Italija

The production facilities

8 production facilities in Austria

- Vienna

- Rohrbach (IPA)

- Glanegg (Hirsch)

- Pinkafeld

- Kemeten

- Sebersdorf

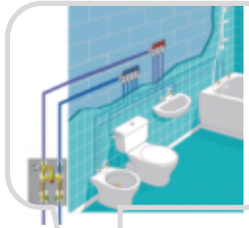
- Bärnbach (Binder)

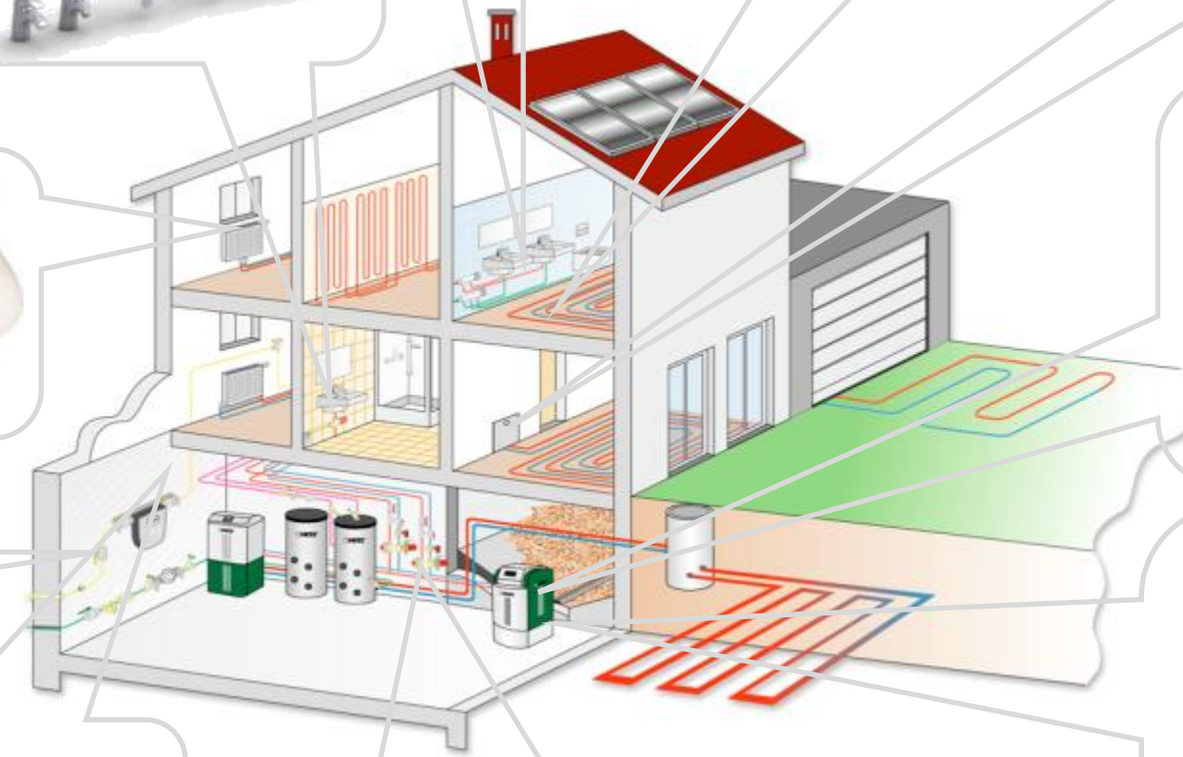
- Salzburg (Universa)

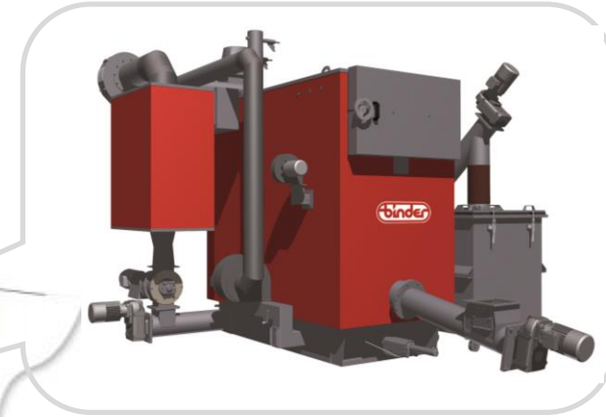
14 production facilities in other european countries

- Poland (3)
- Serbia
- Hungary (3)
- Czechia
- Romania (2)
- Slovenia
- Slovakia (2)
- Italy

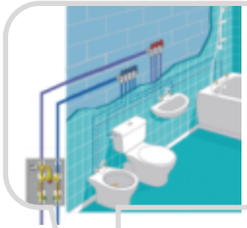
HERZ, Kompletan proizvođač

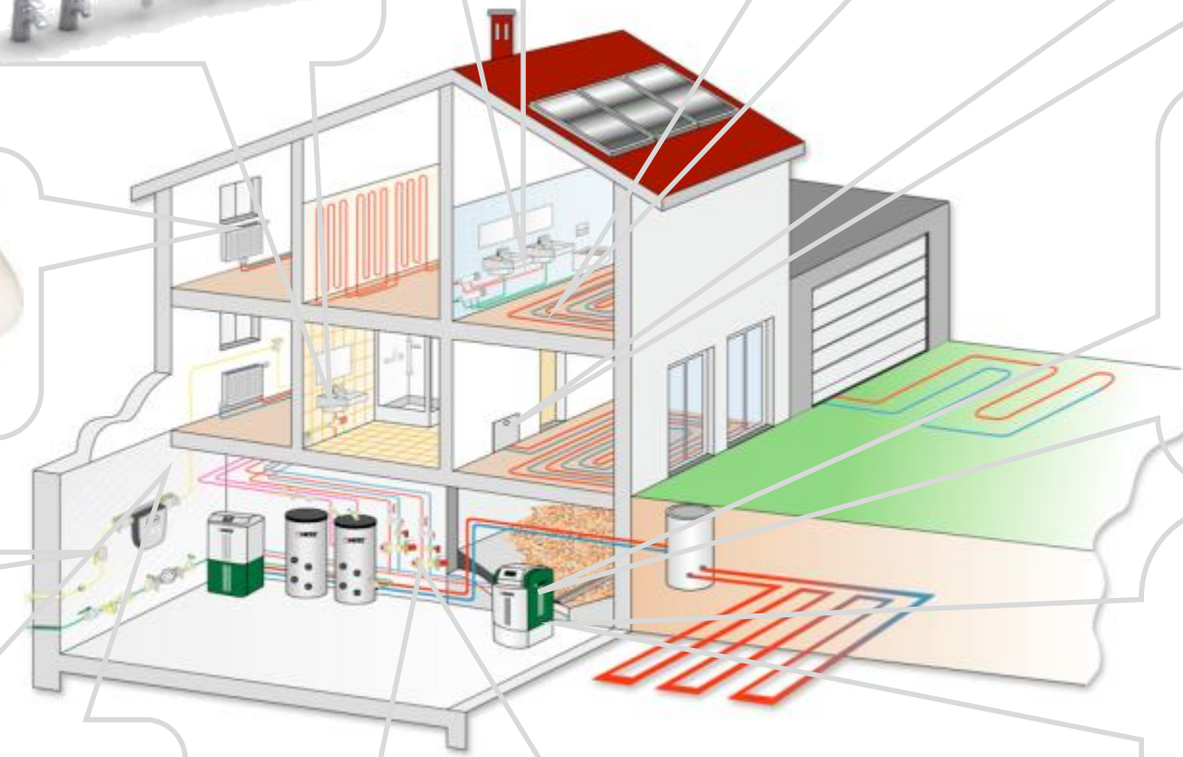


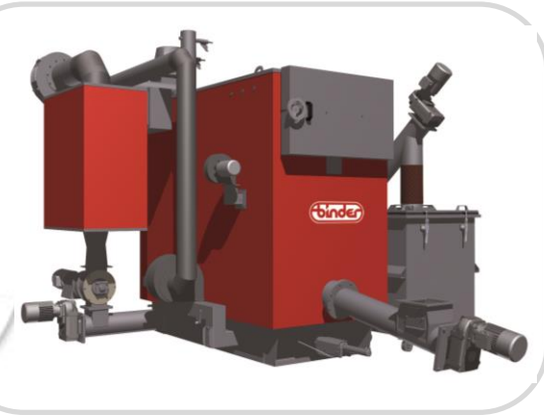




HERZ, the full-service provider

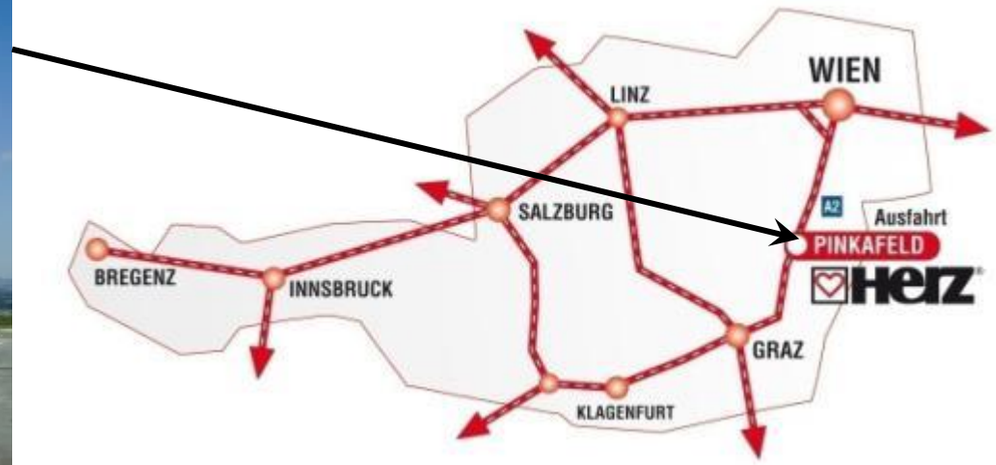






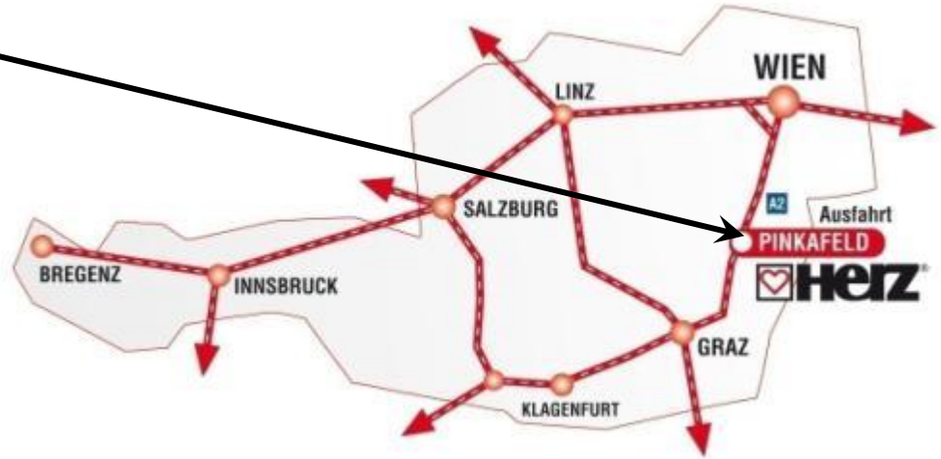
Nova tvornica HERZ Energietechnik u Pinkafeldu

Pinkafeld



- Investicija: € 20.000.000,-
  - Od toga 50% strojevi
- Nova radnja mjesta ~250
- Zemljište: ~ 40.000m² / Izgrađenost u prvoj fazi: 12.000m²
- Uredi, proizvodnja, ispitivanje, tehnički laboratorij, institut

HERZ Energietechnik in Pinkafeld



- Investment costs: € 20.000.000,-
  - 50% for machines
- Employees ~250
- Land area: ~ 40.000m² / Building area stage I: 12.000m²
- Office / R&D-centre (research and development) / production

Novi član u Herz grupi (do 20 MW)
New member in HERZ group (up to 20MW)

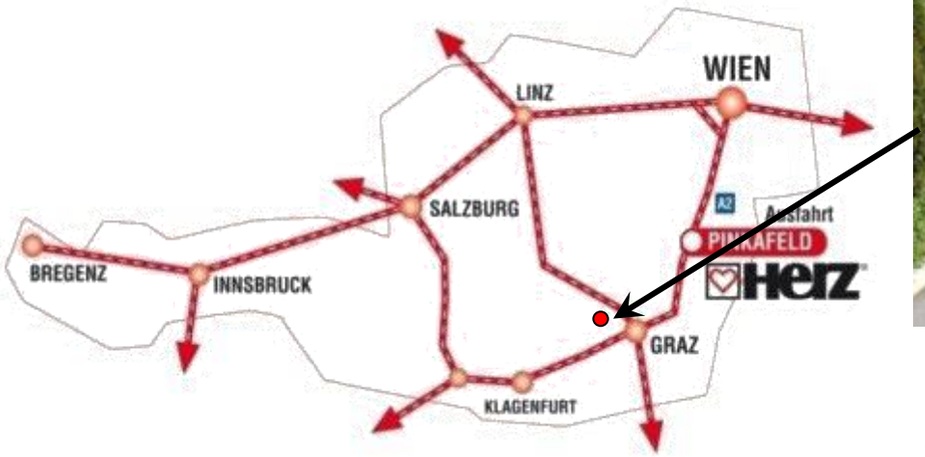
www.binder-gmbh.at
Energy from Biomass

Novi član u Herz grupi (do 20 MW)
New member in HERZ group (up to 20MW)

BINDER Energietechnik Gmb

www.binder-gmbh.at

Energy from Biomass



- Kotlove do 20MW
- Bärnbach
- ~ 80 zaposlenika

BINDER Energietechnik Gmb

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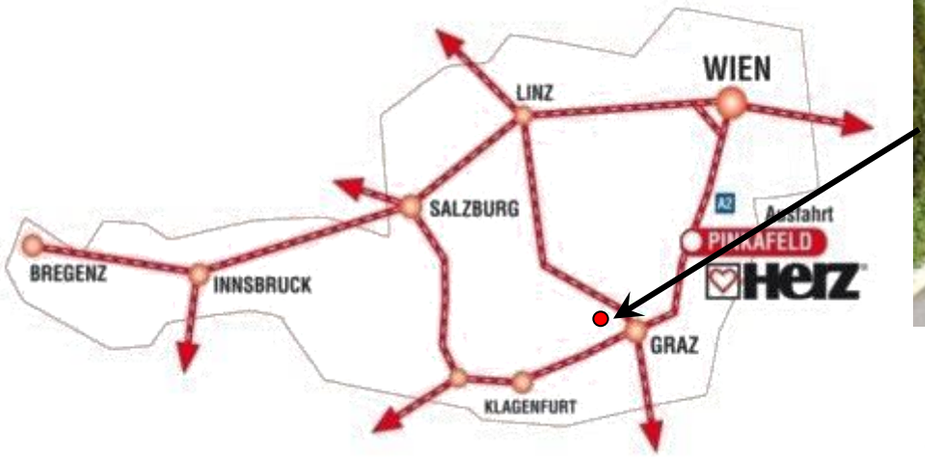
Energy from Biomass



- Boilers up to 20 MW
- Bärnbach
- approx. 80 employees

Proizvodi - Biomasa

Kotlovi na cjepanice

firestar

BioControl	T-Control	Lambda	ECO
18 kW	20 kW 30 kW 40 kW	18 kW 20 kW 30 kW 40 kW	20 kW 30 kW 40 kW

Peleti

pelletstar

T-Control	ECO	CONDENS
10 kW 20 kW 30 kW 45 kW 60 kW	10 kW 20 kW 30 kW 45 kW 60 kW	10 kW 12 kW 14 kW 16 kW

Kombi

pelletfire

20 kW
30 kW
40 kW

Sječka / Peleti

firematic

20 kW 35 kW 45 kW 60 kW	Tipping grate
80 kW 101 kW 130 kW 151 kW 180 kW 201 kW 251 kW 301 kW 351 kW 401 kW 499 kW	Step grate

BioMatic

300 kW
350 kW
400 kW
450 kW

BioFire

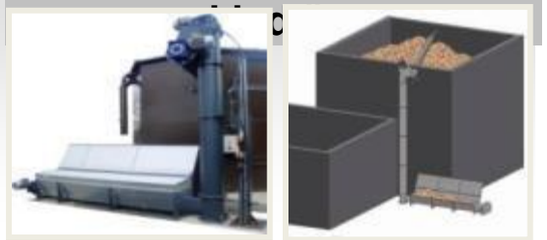
500 kW
600 kW
800 kW
1000 kW
1250 kW
1500 kW

Tehnika spremnika

Spremnici PTV-a
Spremnici topline
Higijenski moduli

Kontejnerska postrojenja

Sustavi za punjenje



The product range - biomass

Log wood

firestar

BioControl	T-Control	Lambda	ECO
18 kW	20 kW 30 kW 40 kW	18 kW 20 kW 30 kW 40 kW	20 kW 30 kW 40 kW

Pellets

pelletstar

T-Control	ECO	CONDENS
10 kW 20 kW 30 kW 45 kW 60 kW	10 kW 20 kW 30 kW 45 kW 60 kW	10 kW 12 kW 14 kW 16 kW

Combi

pelletfire

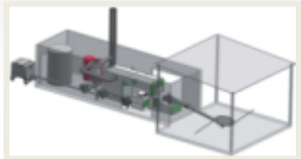
20 kW
30 kW
40 kW

Wood chip / Pellets

firematic		BioMatic	BioFire
20 kW 35 kW 45 kW 60 kW	Tipping grate	300 kW 350 kW 400 kW 450 kW	500 kW 600 kW 800 kW 1000 kW 1250 kW 1500 kW
80 kW 101 kW 130 kW 151 kW 180 kW 201 kW 251 kW 301 kW 351 kW 401 kW 499 kW	Step grate		

Buffer tanks
Hot water tanks
Fresh water modules

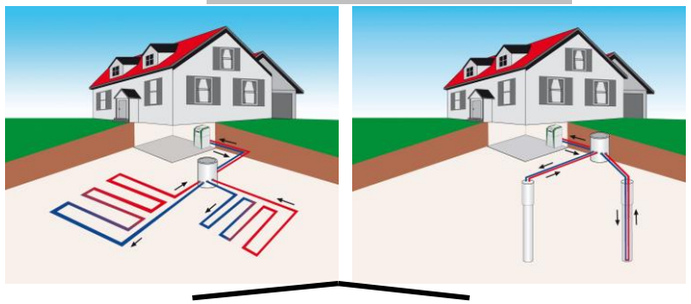
Heating containers



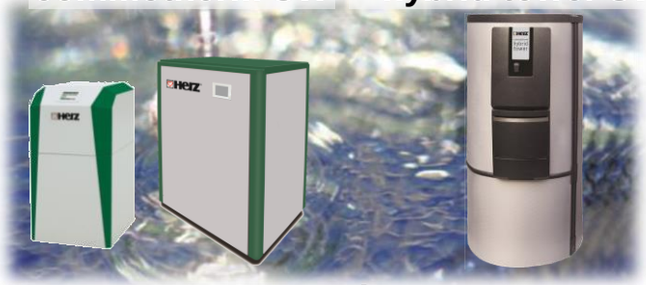
Filling systems

Proizvodi – dizalice topline

rasolina / voda



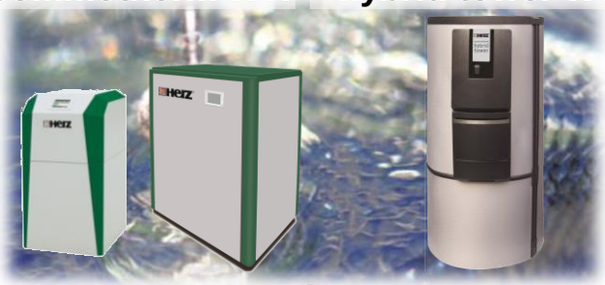
commotherm SW | hybrid tower SW



Type	3~ (3x400 VAC)	1~ (1x230VAC)
5	5,7 kW	4,8 kW
7	7,3 kW	7,4 kW
10	10,6 kW	8,8 kW
12	11,7 kW	11,5 kW
15	14,4 kW	-
23	22,5 kW	-
30	30,1 kW	-
40	39,1 kW	-
60	60,2 kW	-
80	78,2 kW	-

voda / voda

commotherm WW | hybrid tower WW



Type	3~ (3x400 VAC)	1~ (1x230VAC)
5	7,4 kW	5,8 kW
7	9,5 kW	8,8 kW
10	13,8 kW	11,7kW
12	15,1 kW	14,4 kW
15	18,5 kW	-
30	30,5 kW	-
40	40,8 kW	-
60	61,0 kW	-
80	81,6 kW	-

zrak / voda

commotherm LW-A

Type	3~ (3x400 VAC)
6	6,4 kW
8	7,9 kW
10	9,94 kW
13	12,46 kW
17	15,75 kW
23	21,2 kW
30	28,3 kW
40	36,8 kW
60	56,6 kW
80	73,6 kW

pitka voda

commotherm BWP 300 and 500l

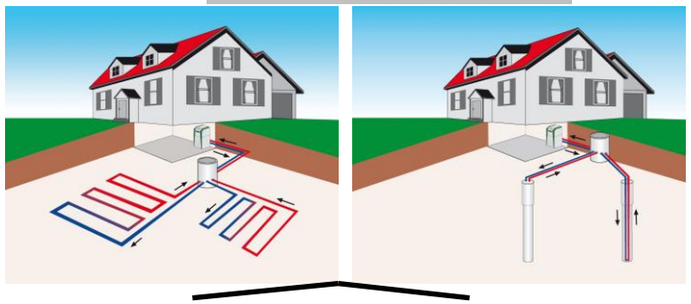
Fresh water module

BioFresh eco

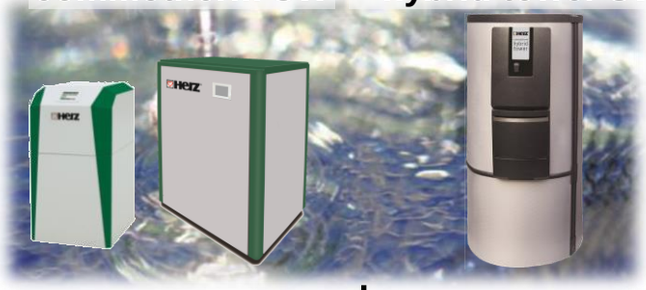
WP-Fresh hydro

The product range - heat pum

brine / water



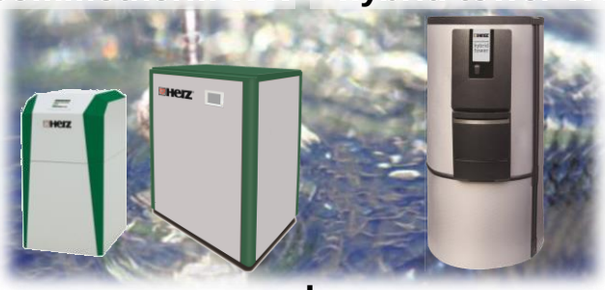
commotherm SW | hybrid tower SW



Type	3~ (3x400 VAC)	1~ (1x230VAC)
5	5,7 kW	4,8 kW
7	7,3 kW	7,4 kW
10	10,6 kW	8,8 kW
12	11,7 kW	11,5 kW
15	14,4 kW	-
23	22,5 kW	-
30	30,1 kW	-
40	39,1 kW	-
60	60,2 kW	-
80	78,2 kW	-

water / water

commotherm WW | hybrid tower WW



Type	3~ (3x400 VAC)	1~ (1x230VAC)
5	7,4 kW	5,8 kW
7	9,5 kW	8,8 kW
10	13,8 kW	11,7kW
12	15,1 kW	14,4 kW
15	18,5 kW	-
30	30,5 kW	-
40	40,8 kW	-
60	61,0 kW	-
80	81,6 kW	-

air / water

commotherm LW-A

Type	3~ (3x400 VAC)
6	6,4 kW
8	7,9 kW
10	9,94 kW
13	12,46 kW
17	15,75 kW
23	21,2 kW
30	28,3 kW
40	36,8 kW
60	56,6 kW
80	73,6 kW

Hot water

commotherm BWP 300 and 500l

Fresh water module

BioFresh eco

WP-Fresh hydro

BINDER - Proizvodi

Toplovodni kotlovi (≤ 110 °C)

Vrelovodni kotlovi (> 110°C)

Kotlovi na zasićenu paru

Zračni izmjenjivači topline

Ložišta

ORC-procesi & CHP-postrojenja

Postrojenja s termičkim uljem

www.binder-gmbh.at

Energy from Biomass

BINDER - product range

Warm water boiler (≤ 110 °C)

Hot water boiler (> 110°C)

Saturated steam boiler

Air-to-air heat exchanger

Combustion chambers

ORC process & CHP systems

Thermal oil systems

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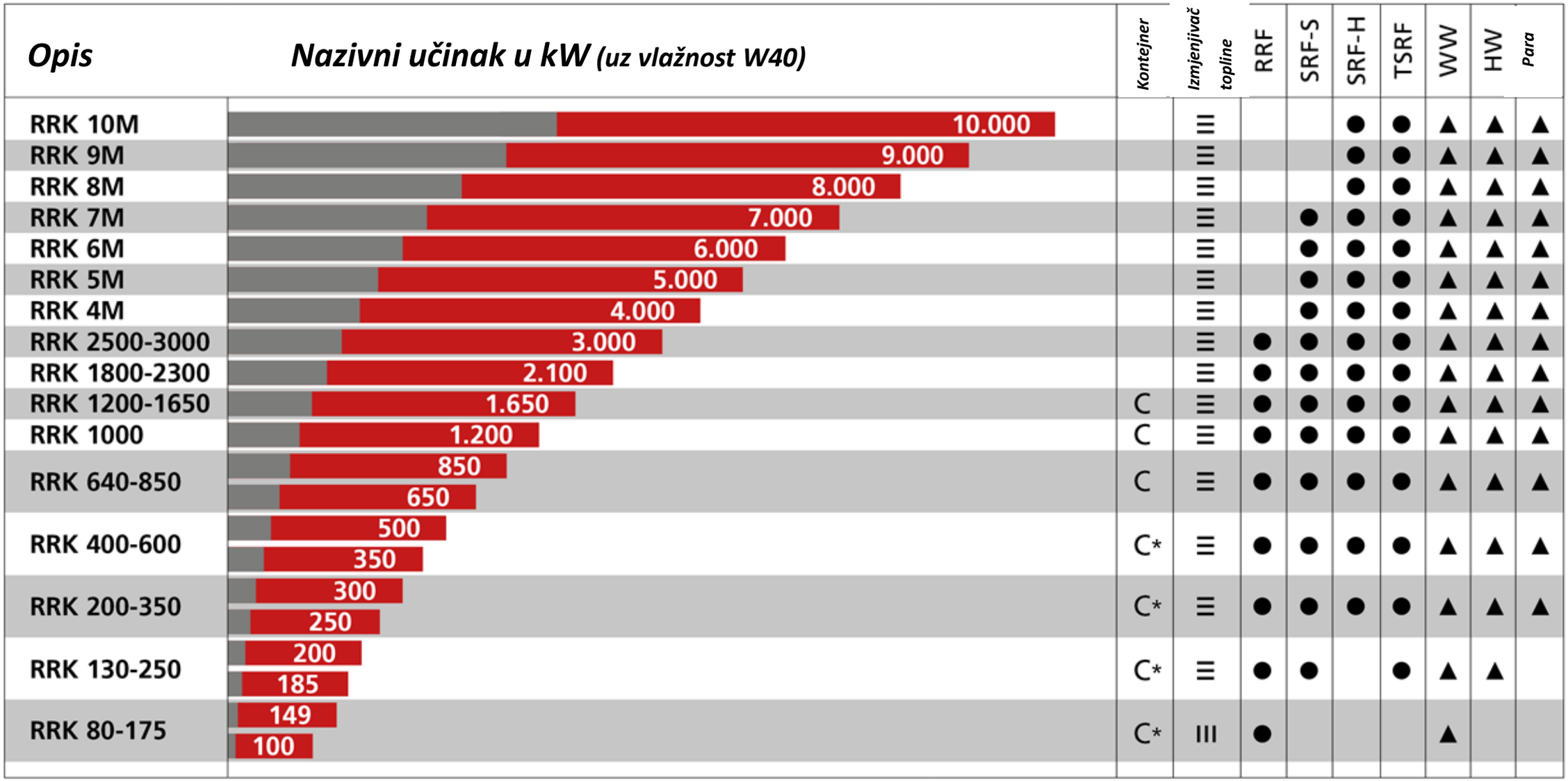
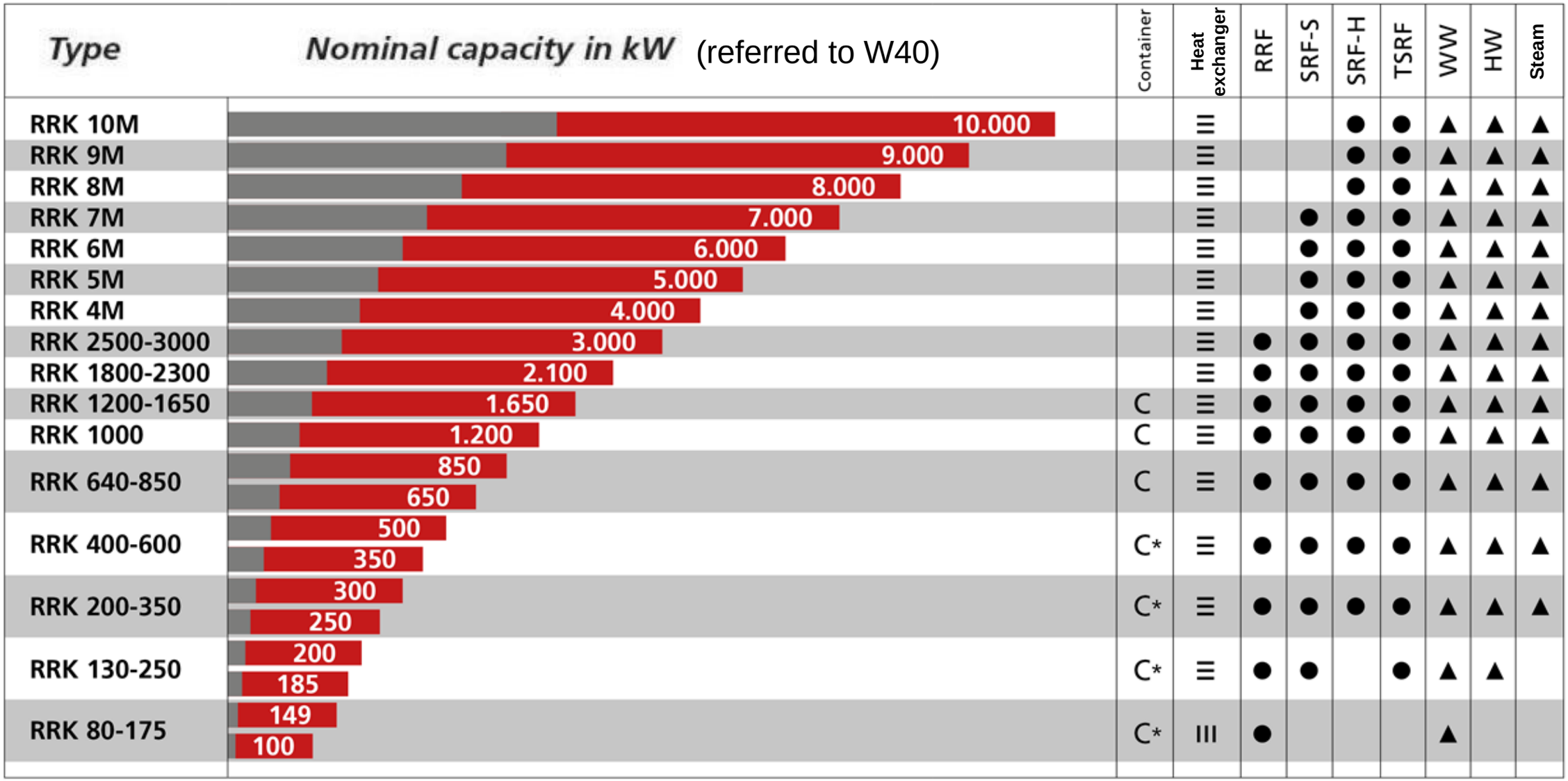
Energy from Biomass

BINDER - proizvodi



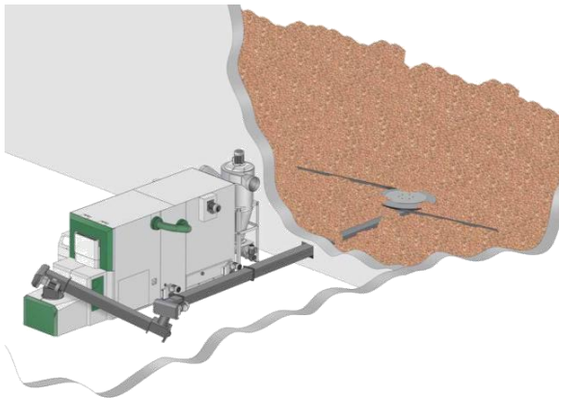
C auch als Containerversion verfügbar.
C in Normcontainer*

BINDER – product range



C available as container version
C in standard container*

Što treba uzeti u obzir kada se projektira?
What should be considered when planning?



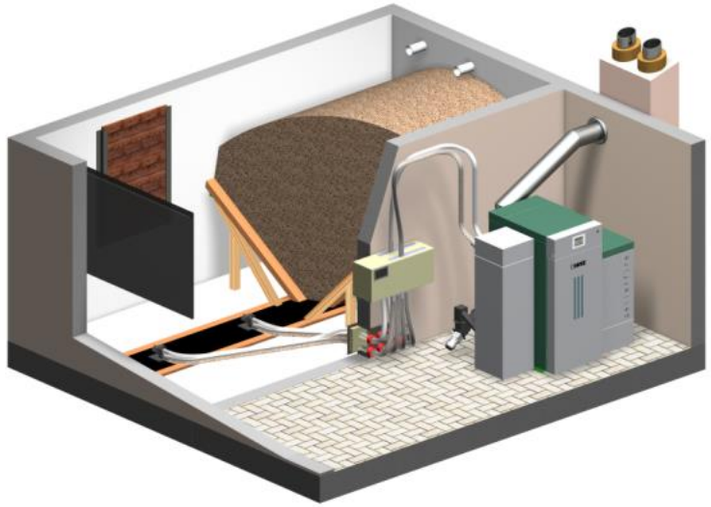
4 važna kriterija:

Zahtjev za toplinom - koliko kW trebamo?
Gorivo - koji materijal je dostupan?
Prostor i mjesto - šta imam na raspolaganju?
Emisije - Koje ograničenja trebam držati?

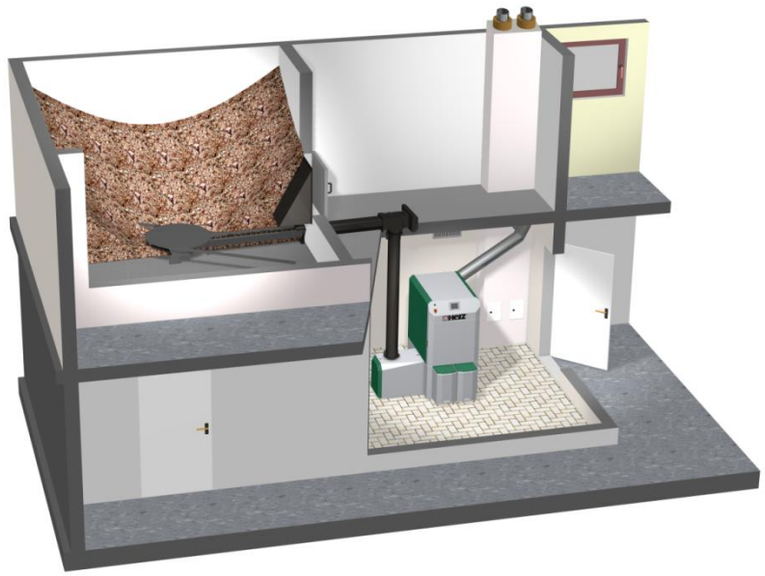
4 important criteria:
Demand for heating – how much kW I need?
Fuel - which material is available?
Space and place - what do I have?
Emissions - what limits should I keep?

Transport biomase – *Logistic of Biomas*

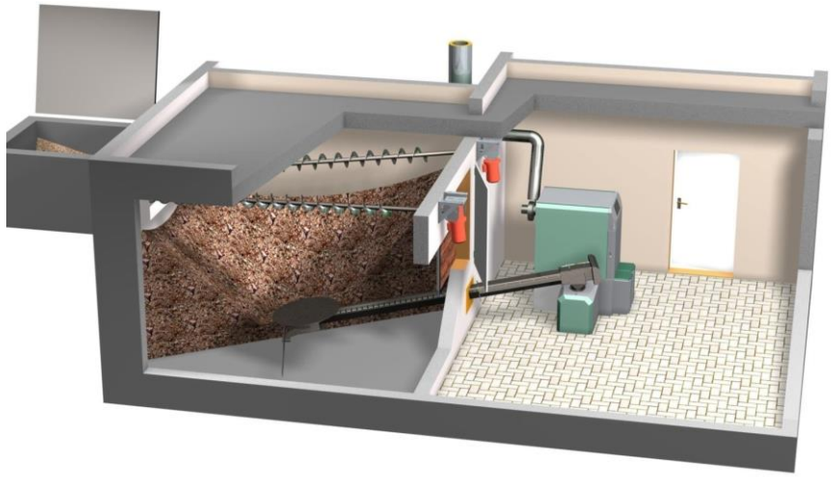
Zavisi od:
Kotla - veličina od kotla i kolika kg/h treba transportirat
Gorivo - koji materijal upotrebljavamo?
Mjesto - šta imam na raspolaganju? velike udaljenosti?



It depends on:
boiler - the size of the boiler and how much kg / h should be transported
Fuel - what material is used?
Place and Space - what do I have? long distances?

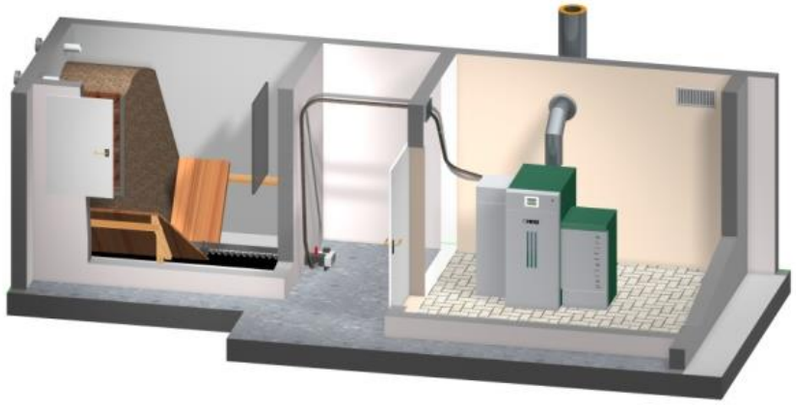


Različiti sustavi dopreme



Puž s mješalicom
i dva puža za punjenje – za sječku i pelete
Screw with agitator and two filling screws– for use of wood chips and pellets

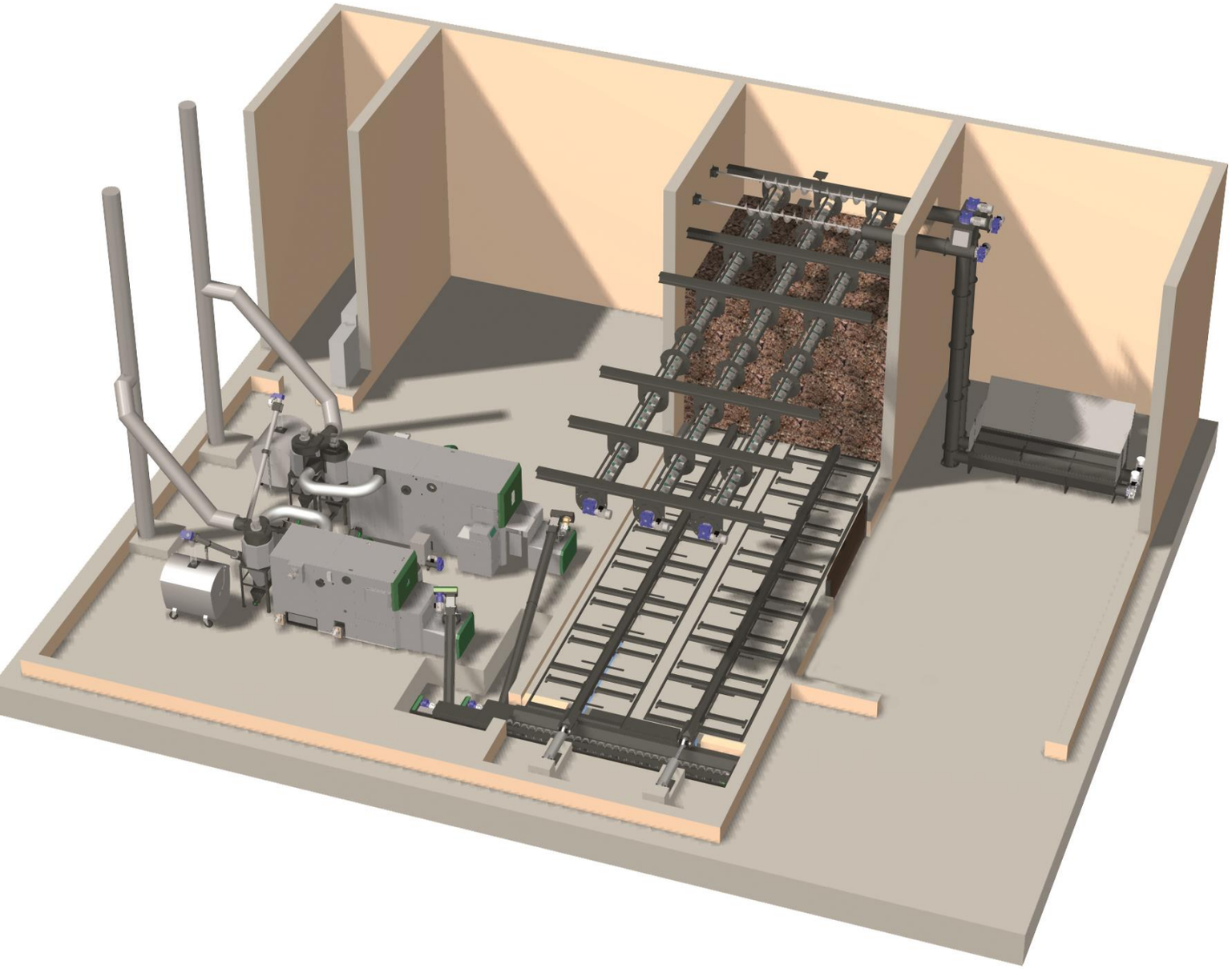
fleksibilni puž – za pelete
Flexible screw – for pellets



Doprema usisavanjem – za pelete
Suction system for use of pelets

Doprema iz platnenog silosa – za pelete
Additonal bag silo system – for pellets

Različiti sustavi dopreme



- Dva kotla u kaskadi
- Hidraulički pomični pod
- Svaki kotao ima svoja dva puža koje ga „hrane“
- Punjenje skladišta preko vertikalnog sustava i dodatna 3 puža za distribuciju (~60m³/h)

- *Two boilers in cascade*
- *Hydrauic walking floor*
- *Every boiler has its own “feeding” system with two screws*
- *filling with vertical transportsystem and distributin screws (~60m³/h)*

Oblici drva za gorivo
Types of wood (biomass)

Drvena sječka
wood-chips

Drvene cjepance
log-wood

Drvene pelete
pellets

Zastoj vod - *water content*:

svježe - *harvested*: 40% - 60%

sušeno - *air-dry*: 15% - 20%

pelete - pellets: <= 10%

Heat values (comparison):

1 litra lož ulja / 1 Nm³ plin

1liter oil / 1m³ gas (~ 10 kWh/l or m³)

~ 2,5 kg sušeno drvo

~ 2,5 kg wood (dry) (~ 4 kWh/kg)

~ 3 kg Drvene sječke

~ 3 kg woodchips (~ 3,3 kWh/kg)

depending on wood type (soft/hard) and water content

~ 2 kg pellete

~ 2 kg pellets (~ 4,9 kWh/kg)

Ovo je samo za orientaciju!

Values are for orientation!

Vrste goriva – *different fuels*

sustavi izgaranja →	RRF	SRF-S	SRF-H	TSRF	PSRF
 piljevina od brušenja	●			●	
piljevina od rezanja	●			●	
 piljevina od hoblanja i frezanja	●	●		●	
ostaci ploča od iverice	●	●		●	
 sječka iz šume	●	●		●	
sječka iz poljopriv.		●	●		
industrijska sječka		●	●		

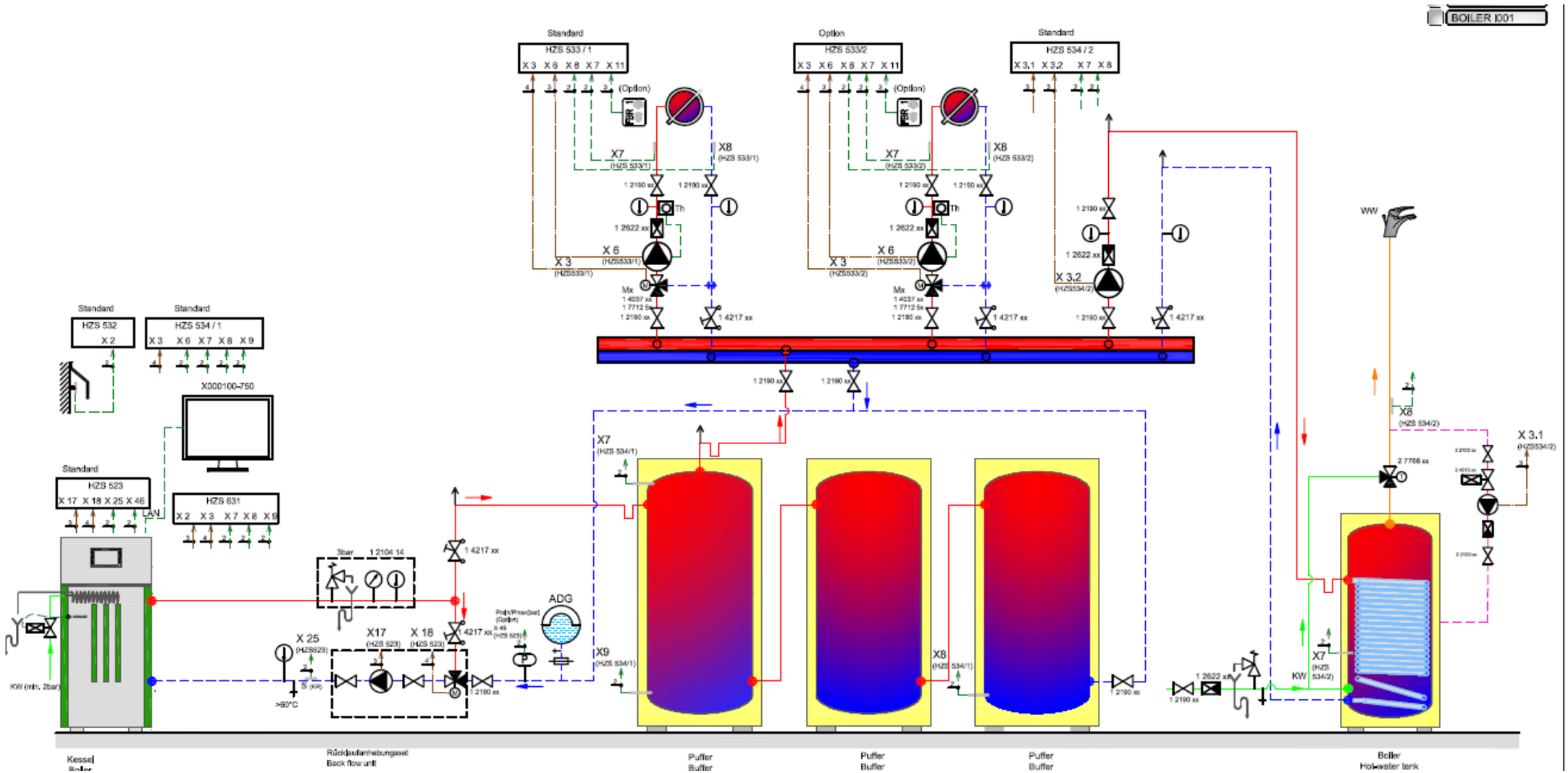
sustavi izgaranja →	RRF	SRF-S	SRF-H	TSRF	PSRF
 kora			●		
drobljeno, lomljeno i drvo za pakiranja			●		
 energetski biljni nasadi		●		●	
ostatci u proizvodnji sokova, ostaci prešanja		●		●	
 peleti od drva	●				●
industrijski peleti	●				●
treset i agro peleti					●

Combustion systems→	RRF	SRF-S	SRF-H	TSRF
 Swarf	●			●
Saw dust	●			●
 Shavings- millings	●	●		●
Chipboard, MDF	●	●		●
 Virgin wood chips	●	●		●
Chip from landscape managment		●	●	
Industrial wood chips		●	●	

Combustion systems→	RRF	SRF-S	SRF-H	TSRF
 Bark			●	
Shredded demolition & packaging wood			●	
 Wood baes energy crops (chaffed)		●		●
Pomace, juice production residues		●		●
 Wood pellets	●			●
Industrial pellets	●			●
Turf pellets, agro-pellets				●

Vrste goriva – *different fuels*

- peleti od šećerne trska – *pellets of sugar cane*
- peleti od ostataka suncokreta – *pellets of the remnants of sunflower*
- sjemenke bundeve – *pumpkin seeds*
- koštice od trešnje - *pits from cherries*
- grah, žitarice i dr. – *beans, cereals and others*
- peleti od treseta – *peat pellets*
- životinjski gnoj, kosti - *animal manure, bones*
- ...



Primjer preporučene hidraulične sheme

Example of hydraulic diagrams

Servis - Service

- Maksimalna sigurnost kroz servisne usluge jedan put godišnje od strane HERZ
- Veća učinkovitost kroz optimalne postavke
- Ispitivanje funkcije električnih i mehaničkih komponenti, kao i sigurnosnih uređajaTRVB 118
- Nadogradnja novijih softvera
- Dulji vijek zahvaljujući stručnim savjetima
- Provjera tijela kotla i komponenti na trošenje
- Redoviti servisi smanjuju troškove održavanja

- The highest possible safety due to a plant service per year by the HERZ customer service

- Better efficiency thanks to optimal settings

- Functional testing of electrical and mechanical components as well as safety devices according to TRVB 118

- software updates

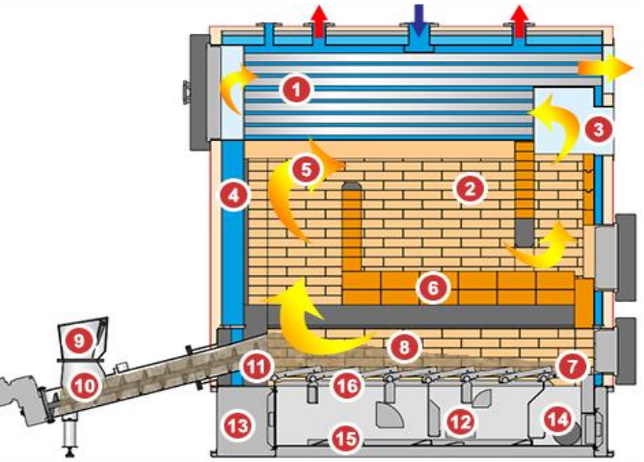
- Longer service life thanks to professional support

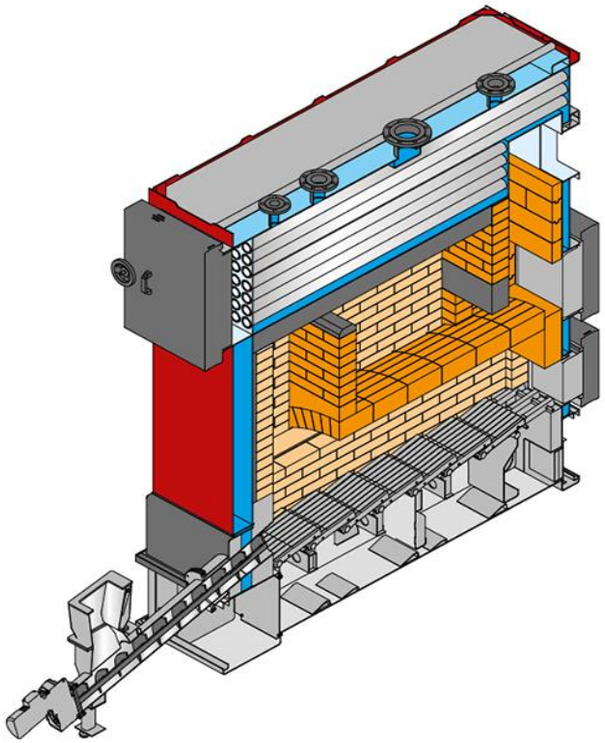
- Check the boiler body and the parts for wear

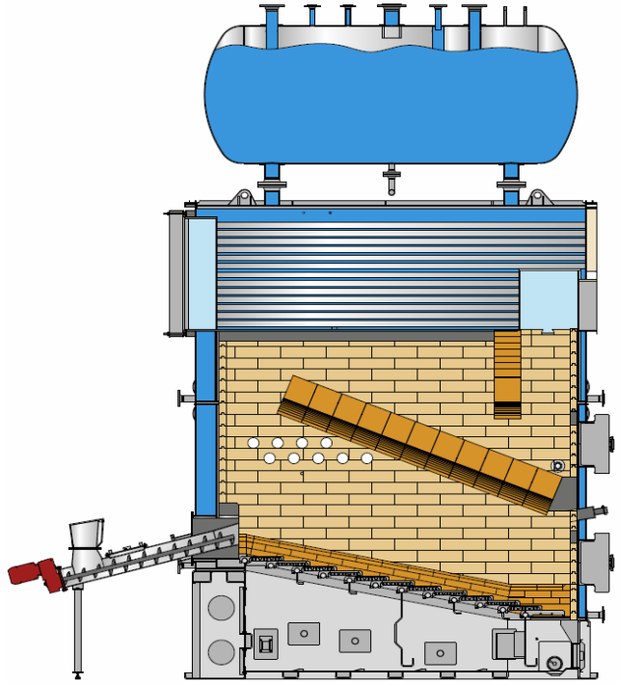
- More favorable to individual maintenance

Tehnilogija

Tehnology

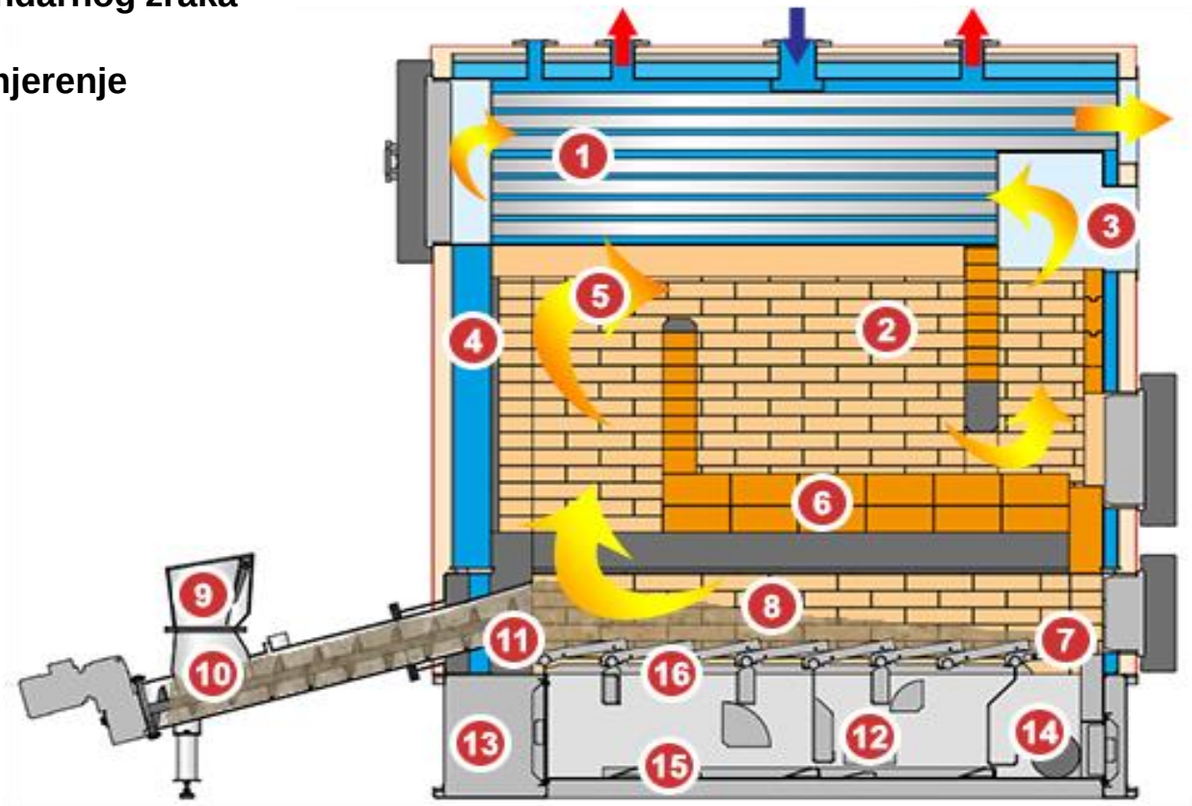






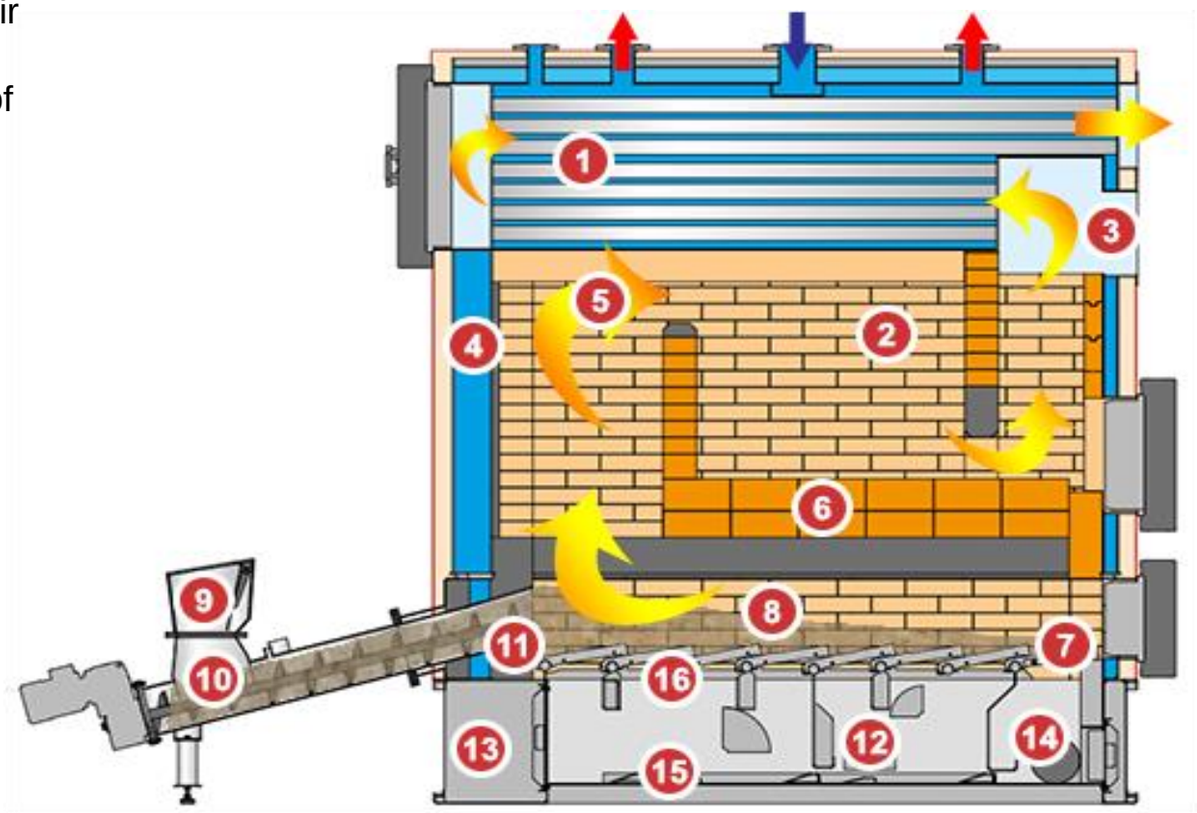
Toplovodni – vrelovodni kotlov

1. Izmjenjivačke cijevi
2. Šamotiranje
3. Čišćenje izmjenjivača
4. Zidovi obloženi vodom
5. Dovod sekundarnog zraka
6. krov za usmjerenje
7. Istresanje pepela
8. Ložište
9. Zaštita od povrata plamena
10. Doziranje goriva
11. Pomična rešetka od 150 kW
12. Dovod primarnog zraka
13. Industrijska kvaliteta
14. Puž za odvođenje pepela
15. Pomicanje pepela struganjem
16. Segmenti rešetke



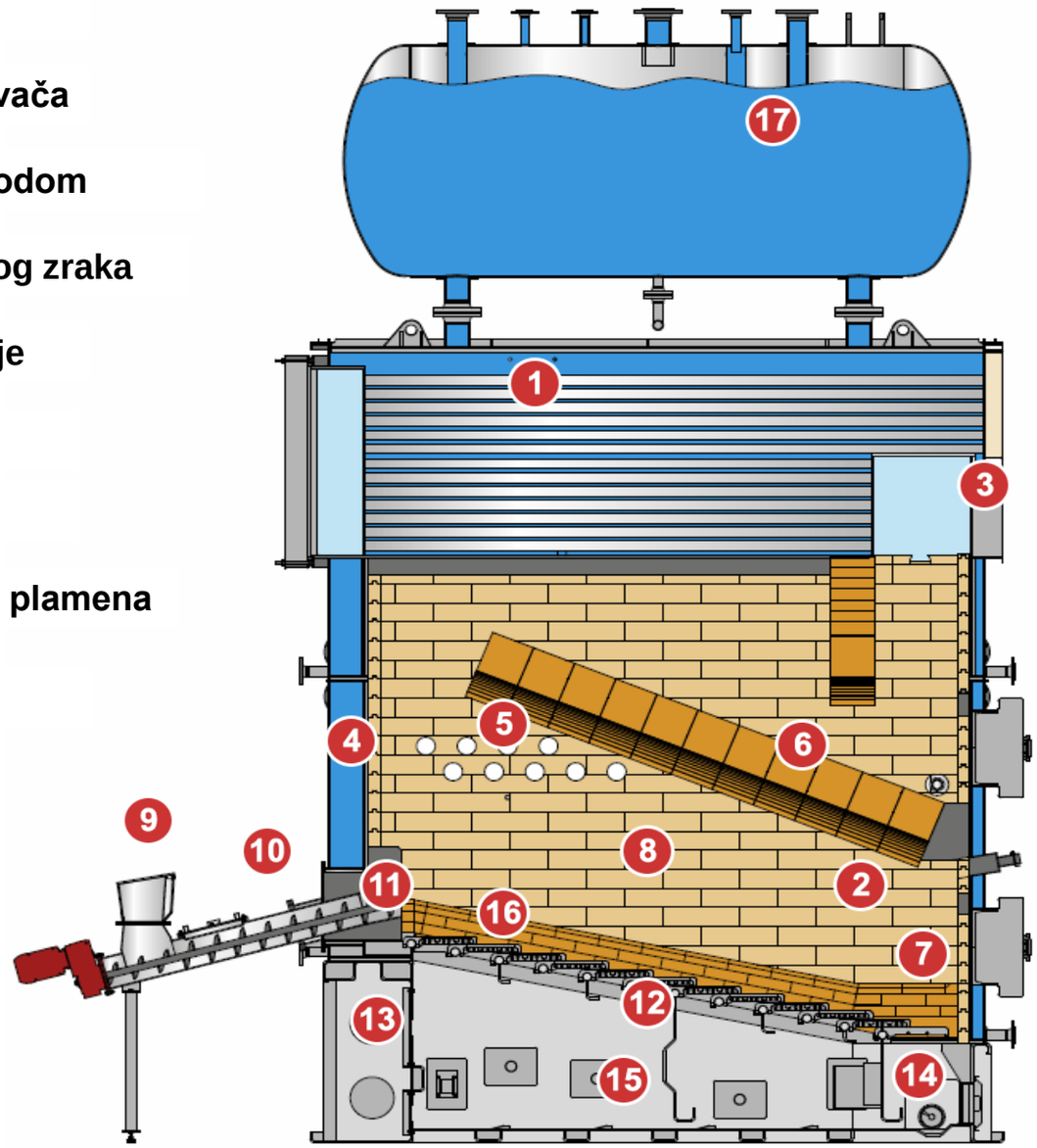
Warm- hot water boilers

1. heat exchanger pipes
2. firebrick
3. heat exchanger cleaning
4. water-carrying boiler walls
5. secondary air
6. radiation roof
7. grid sieve
8. combustion chamber
9. return fire protection
10. feed
11. sliding grate boiler from 150kW
12. primary air
13. industry quality
14. ash screw
15. ash slider
16. grate elements



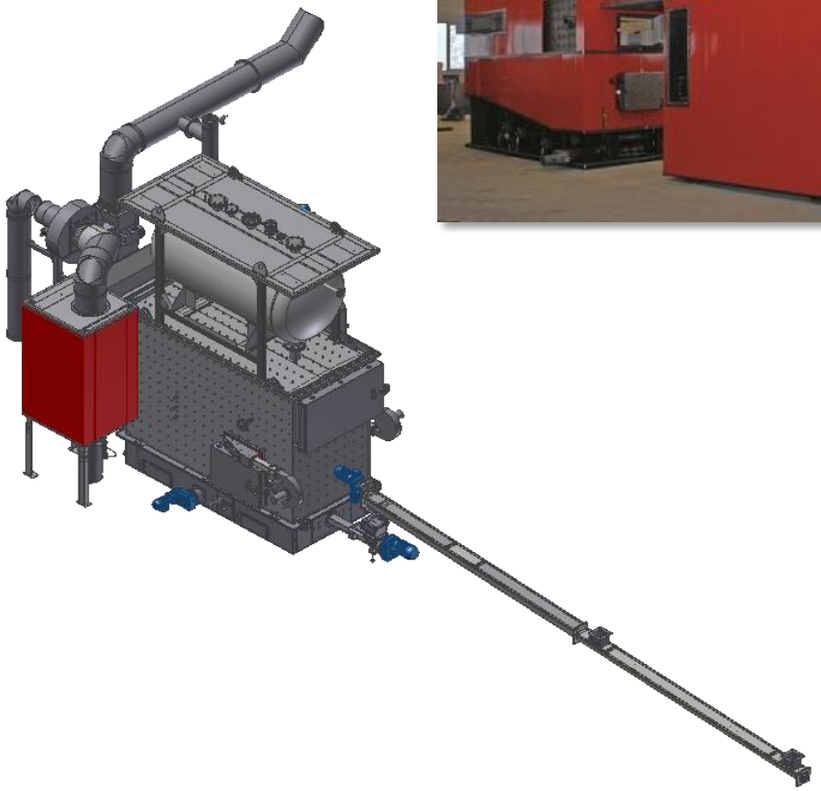
Kotlovi na zasićenu paru

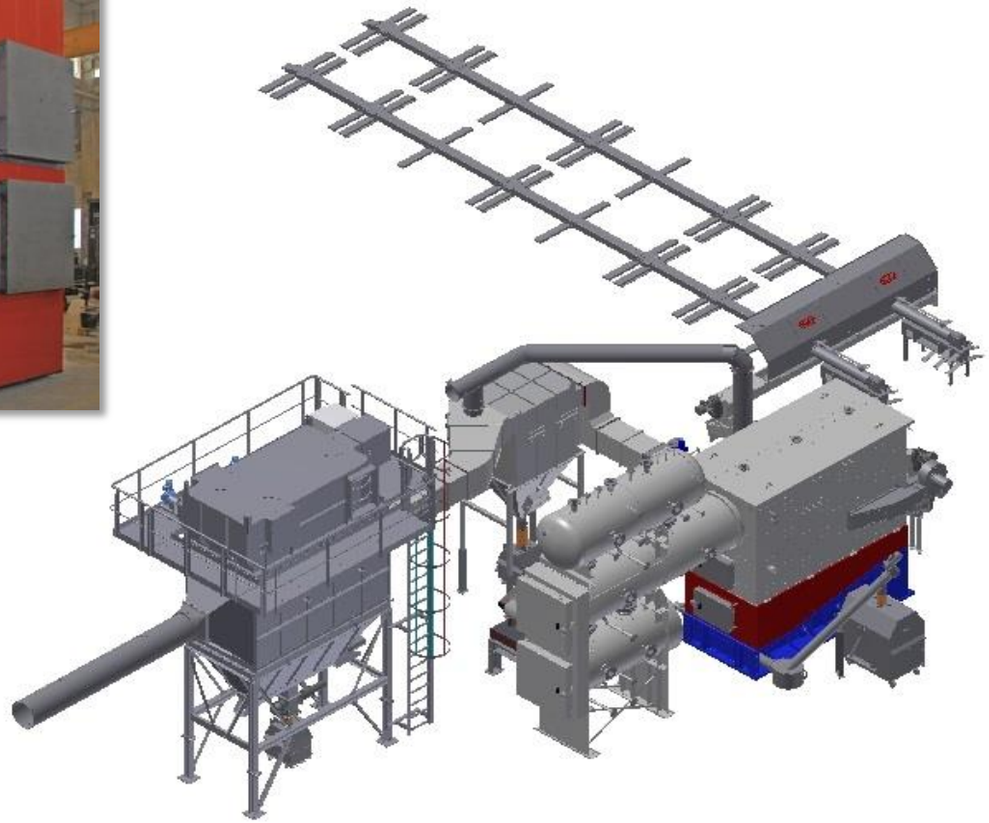
1. Izmjenjivačke cijevi
2. Šamotiranje
3. Čišćenje izmjenjivača
4. Zidovi obloženi vodom
5. Dovod sekundarnog zraka
6. krov za usmjerenje
7. Istresanje pepela
8. Ložište
9. Zaštita od povrata plamena
10. Doziranje goriva



11. Pomična rešetka od 150 kW
12. Dovod primarnog zraka
13. Industrijska kvaliteta
14. Puž za odvođenje pepela
15. Pomicanje pepela struganjem
16. Segmenti rešetke
17. Kupola pare - spremnik

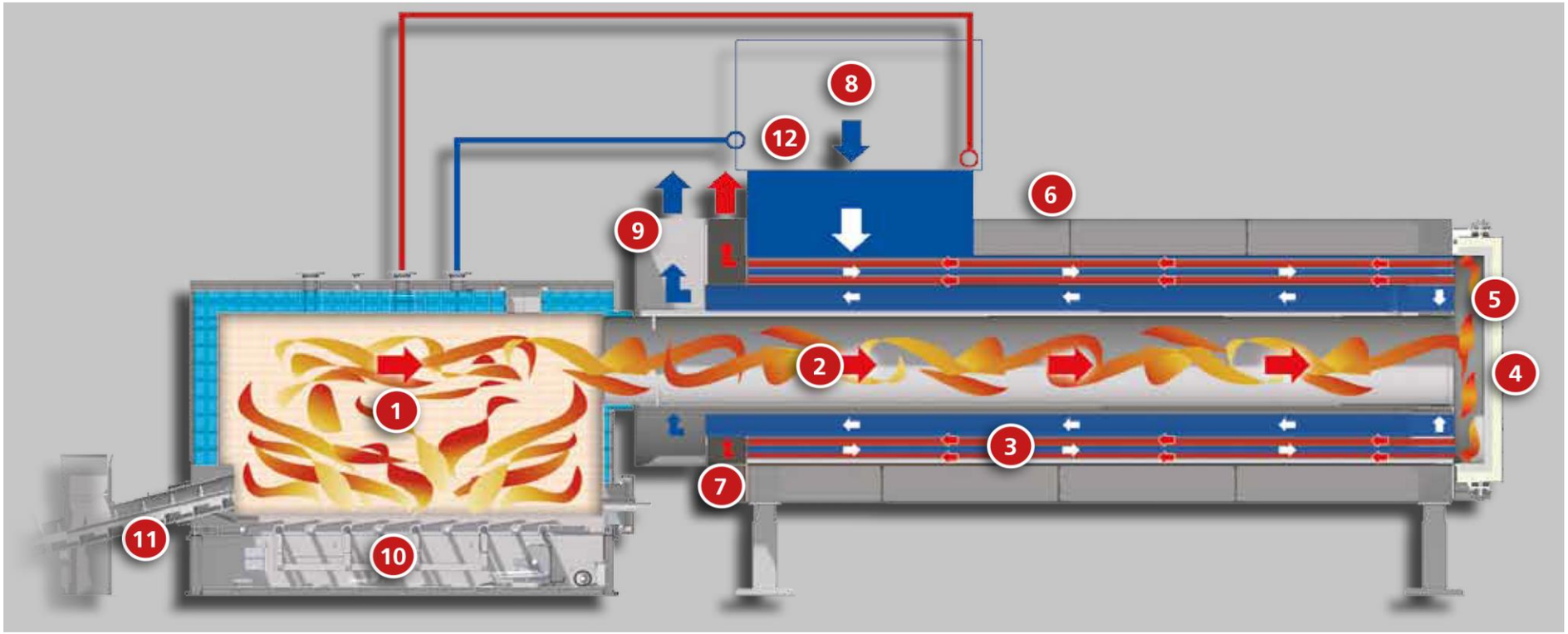
Kotlovi na zasićenu paru
saturated steam boilers





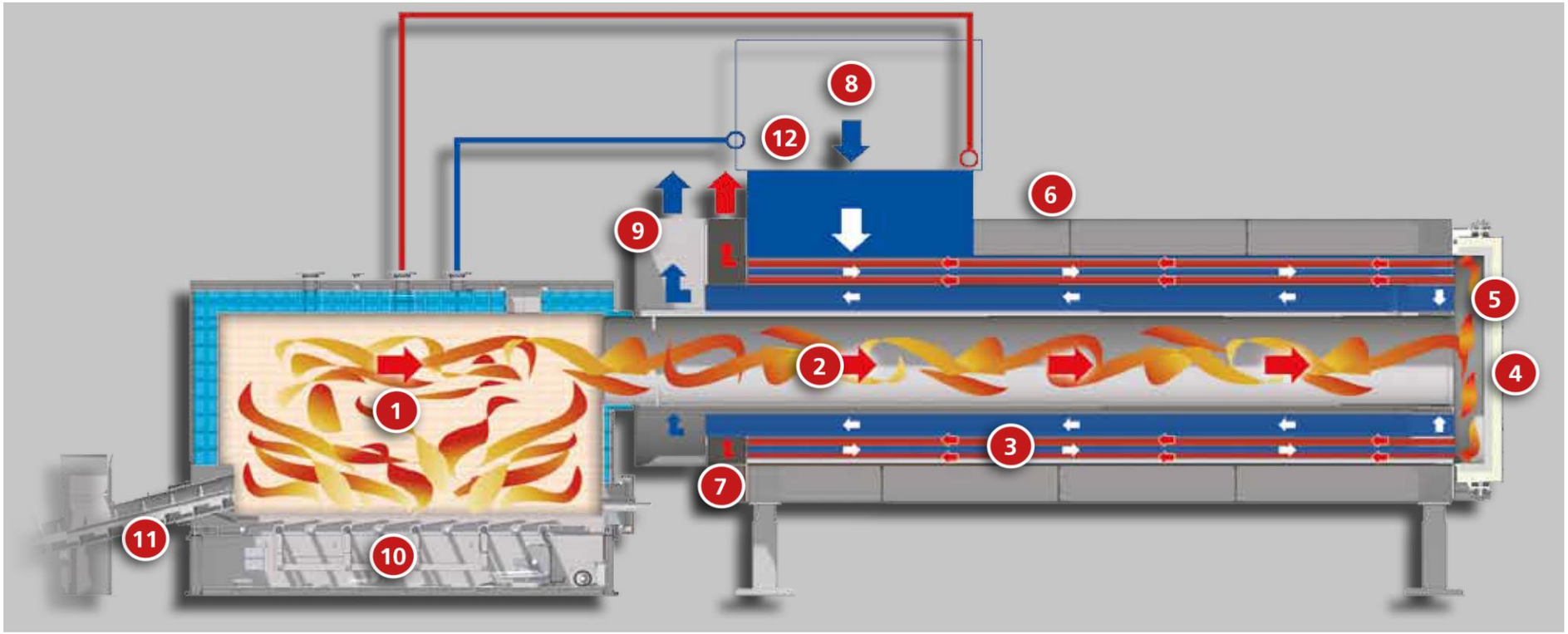
Zračni izmjenjivač topline

1. Ložište obloženo vodom
2. Plamena cijev
3. Izmjenjivačke cijevi
4. Vrata za čišćenje
5. Obilazna komora
6. Zračni izmjenjivač
7. Izlaz dimnih plinova
8. Dovod svježeg zraka
9. Odvod svježeg zraka
10. Sustav za izgaranje
11. Doziranje goriva
12. Predgrijavanje svježeg zraka



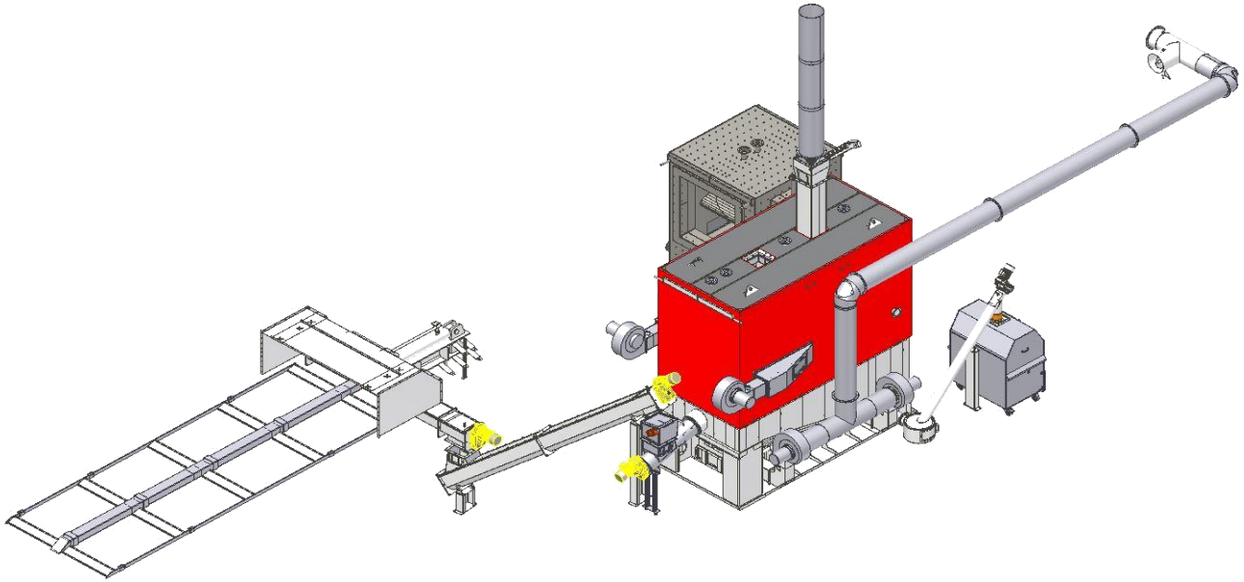
Air heat exchanger

1. water-carrying combustion chamber
2. flame tube
3. heat exchanger pipes
4. maintenance door
5. reversing chamber
6. air heat exchanger
7. flue gas output
8. fresh air inlet
9. fresh air output
10. firing system
11. feed
12. air preheating



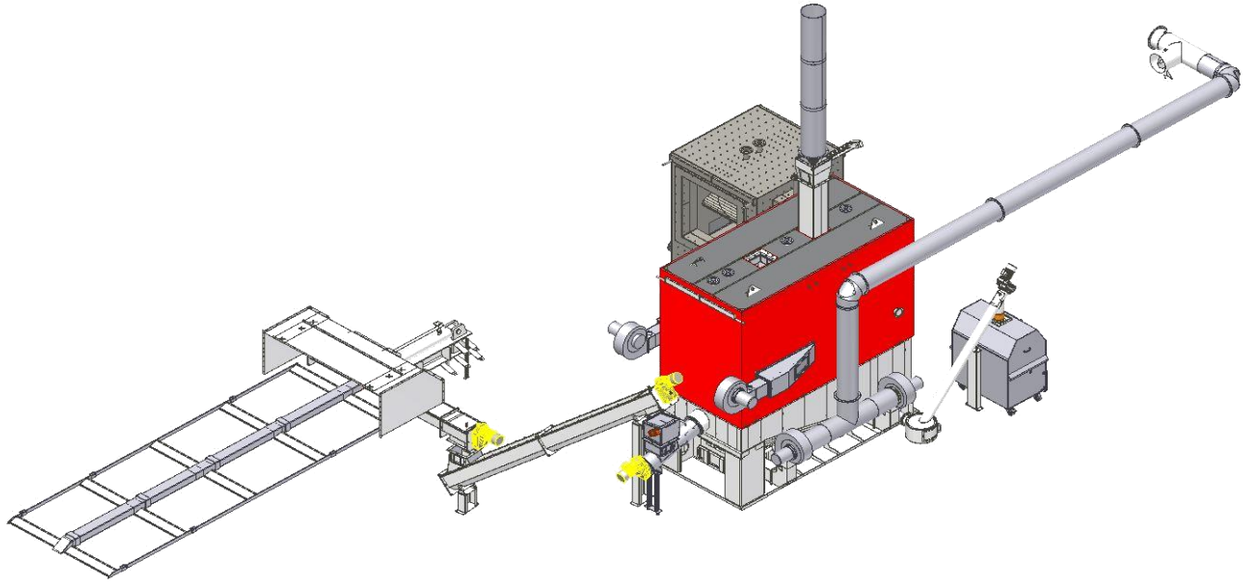
Ložišta

- Ložišta ložena biomasom
- Dimni plinovi za procese
- Optionalno s miješajućom komorom



Combustion chamber

- biomass-fired combustion chamber
- flue gases for processes
- optional with mixing chamber



BINDER – ORC System

Direktni sustav:

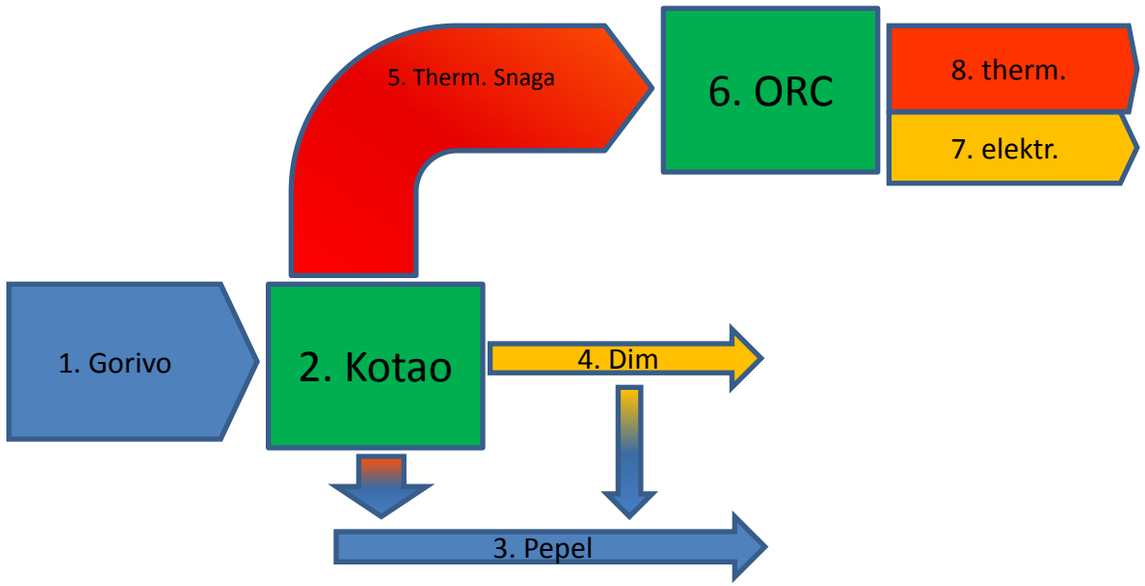
- Upotreba plinova izgaranja u procesu
- manje gubitke topline

Indirektni sustav:

- korištenje drugih medije za ORC proces

tople vode
para
vreo zrak/dim
vruće ulje

- postoji mnogo načina za ORC



BINDER – ORC System

Direct system:

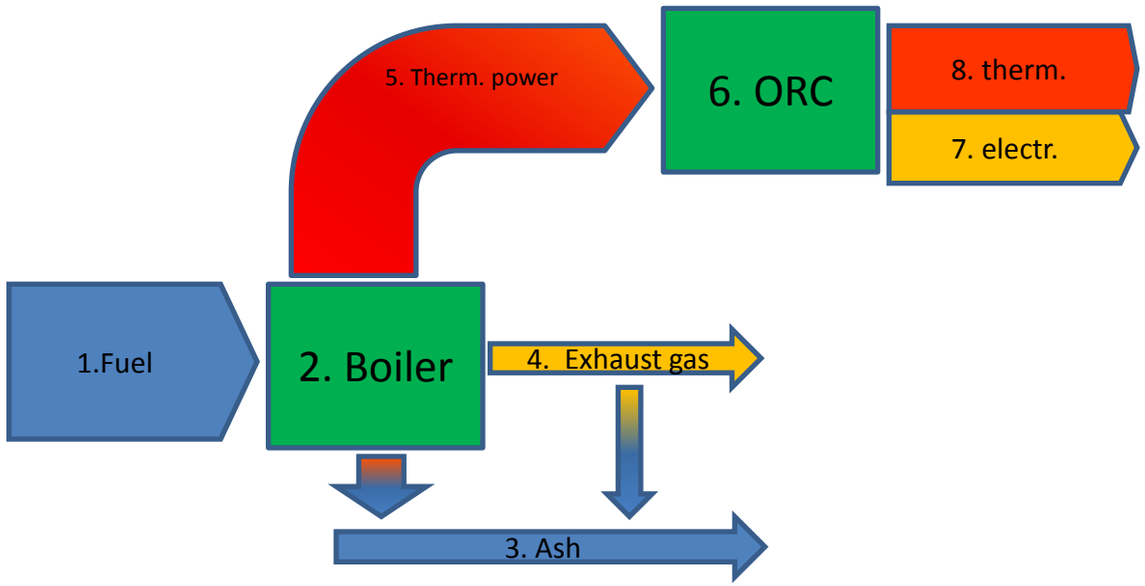
The use of combustion gas in the ORC process driving

less heat loss

Indirect system:

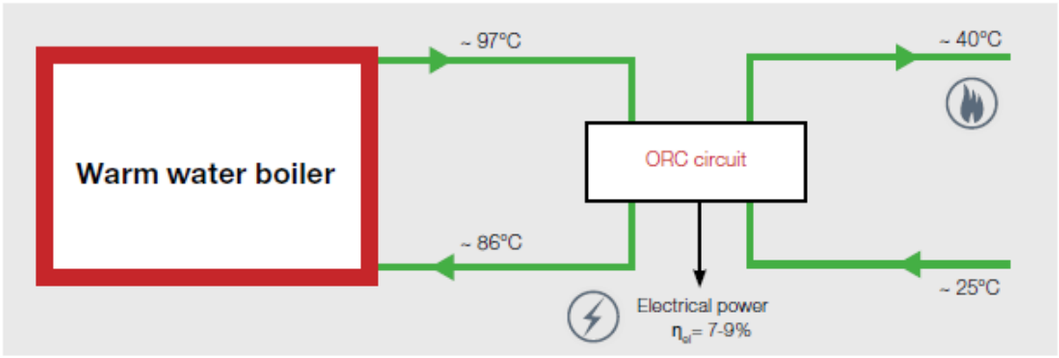
drive using other media in the process of ORC
hot water
steam
hot air / smoke
hot oil

Although many ways to ORC

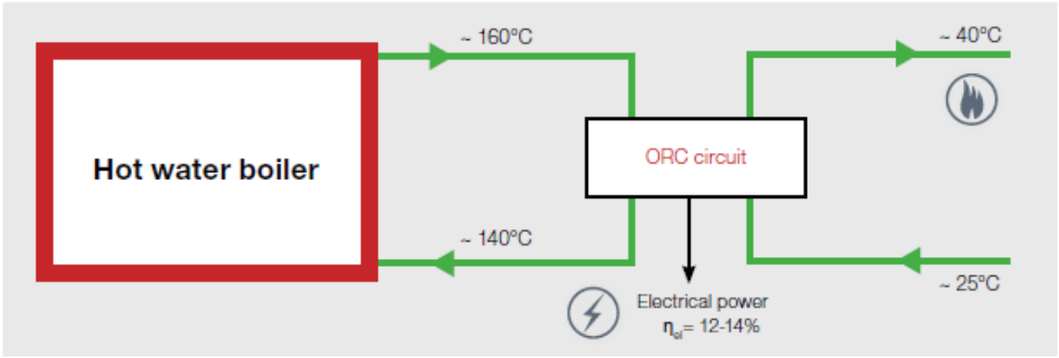


Kako izgleda ORC sistem?
How looks like this ORC?

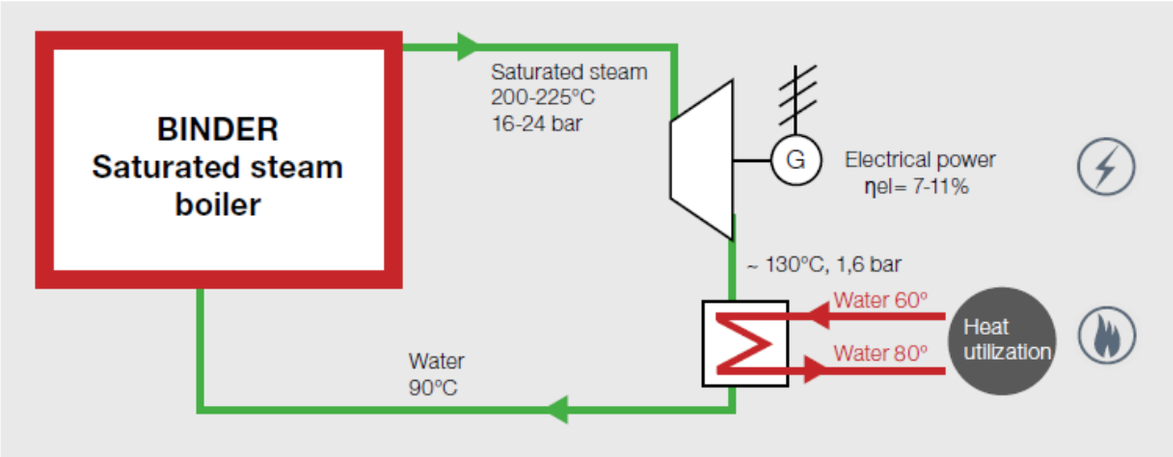
LOW TEMPERATURE-ORC-SYSTEM with warm water boiler



LOW TEMPERATURE-ORC-SYSTEM with hot water boiler



HIGH TEMPERATURE SYSTEM
Saturated steam turbine: back pressure turbine

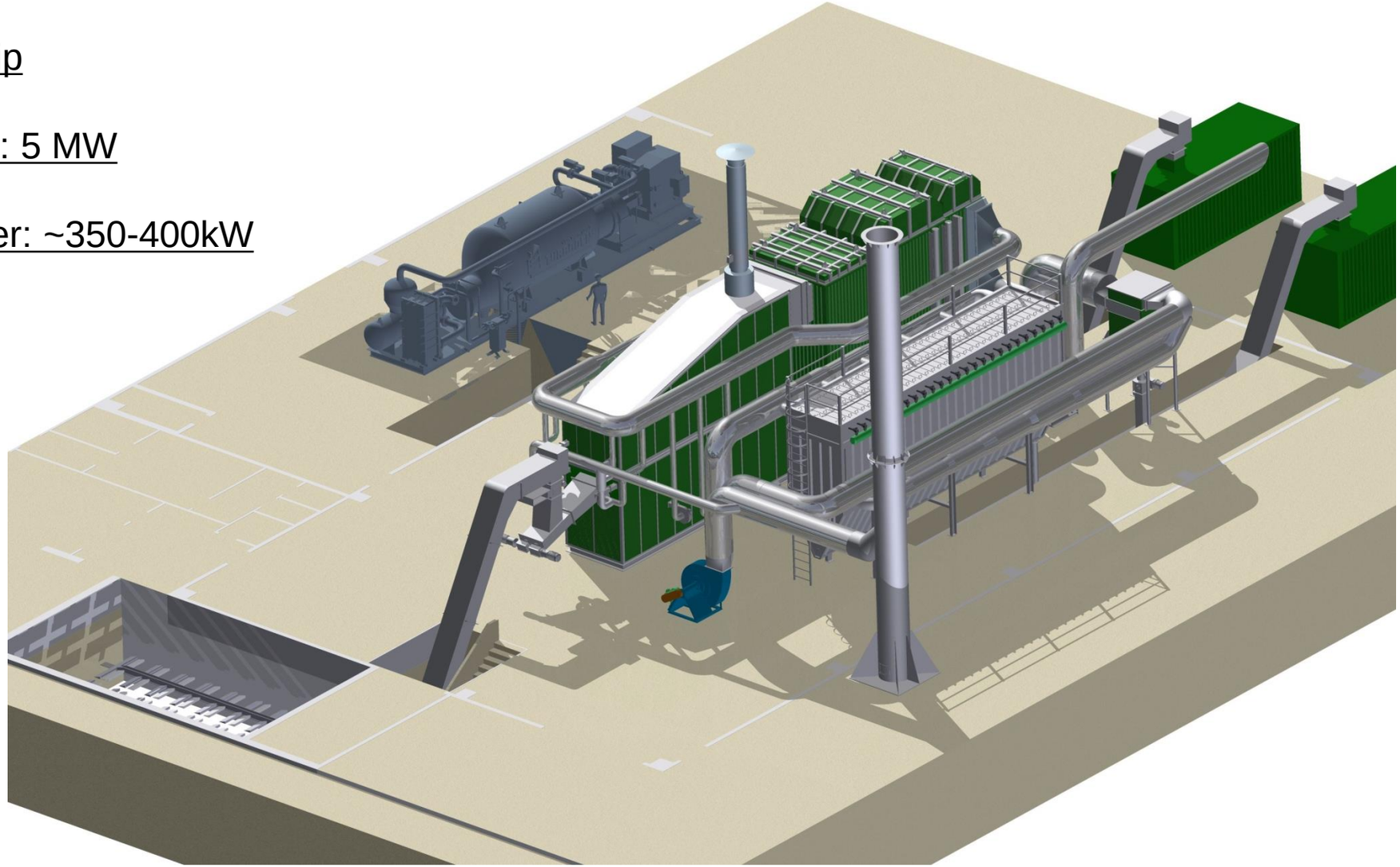


BINDER – ORC boiler

fuel: wood chip

thermal power: 5 MW

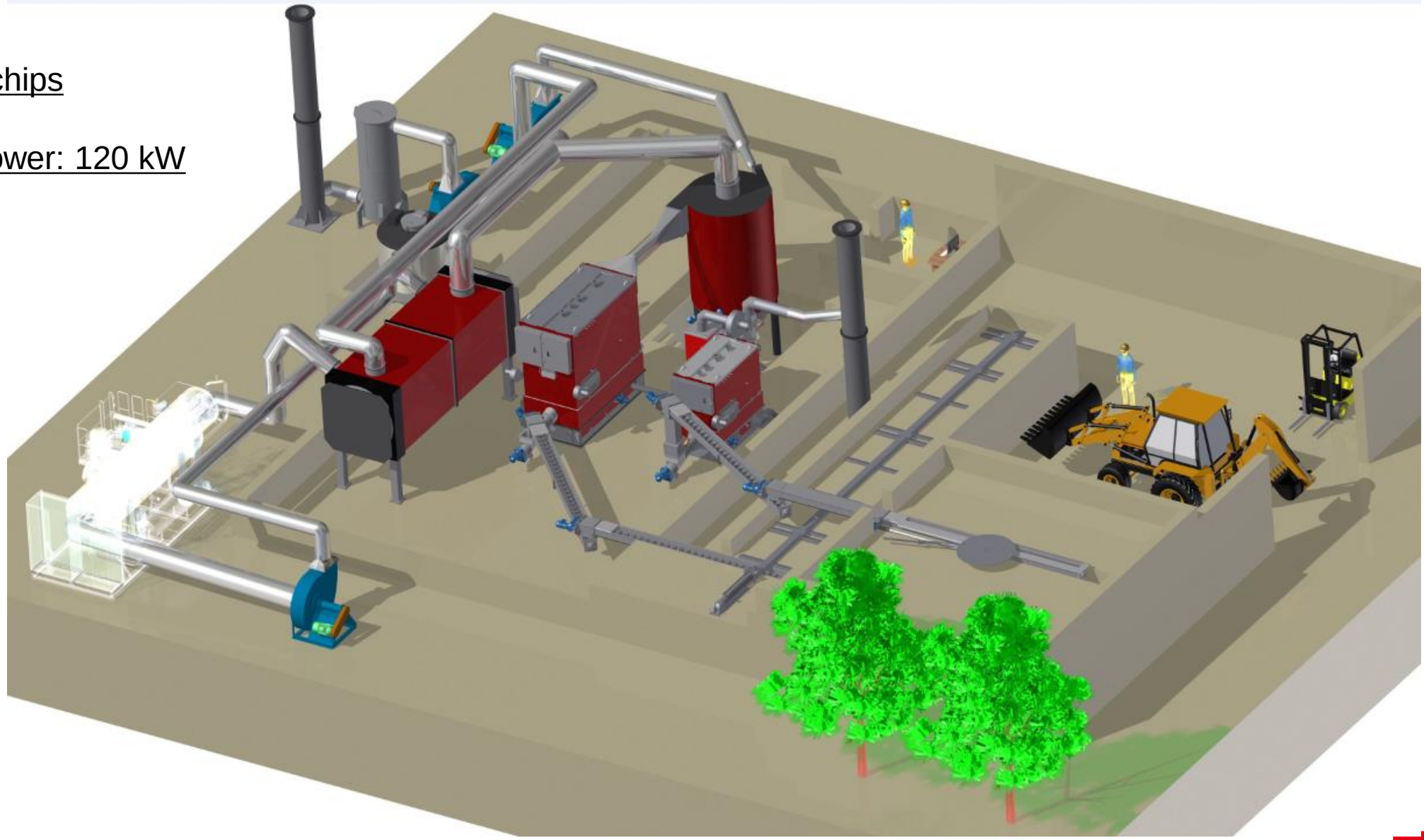
electrical power: ~350-400kW



BINDER – ORC 1,2 MW + 850 kW

fuel: wood chips

electrical power: 120 kW



Toplana u Pokupskom

BioFire 1000 BioControl
HR-10414 Pokupsko
Snaga 1000 kW
Toplana na biomasu
Projekt izveden u suradnji s EU fondovima

Namjena:

Toplifikacija naselja Pokupsko

Doprema sječke pomičnim podom (veličina P45)

Automatski odvoz pepela u vanjski spremnik

Kaznionica Lepoglava

BINDER RRK 2500-3000
HR-42250 LEPOGLAVA
Snaga 3000 kW

Kotlovnica na biomasu u kaznionici Lepoglava

Namjena:

Za potrebe grijanja kaznionice Lepoglava

Za tehnološke potrebe

Doprema sječke pomičnim podom

Sječka veličine P100

Kaznionica Lepoglava

BINDER RRK 2500-3000
HR-42250 LEPOGLAVA
Snaga 3000 kW

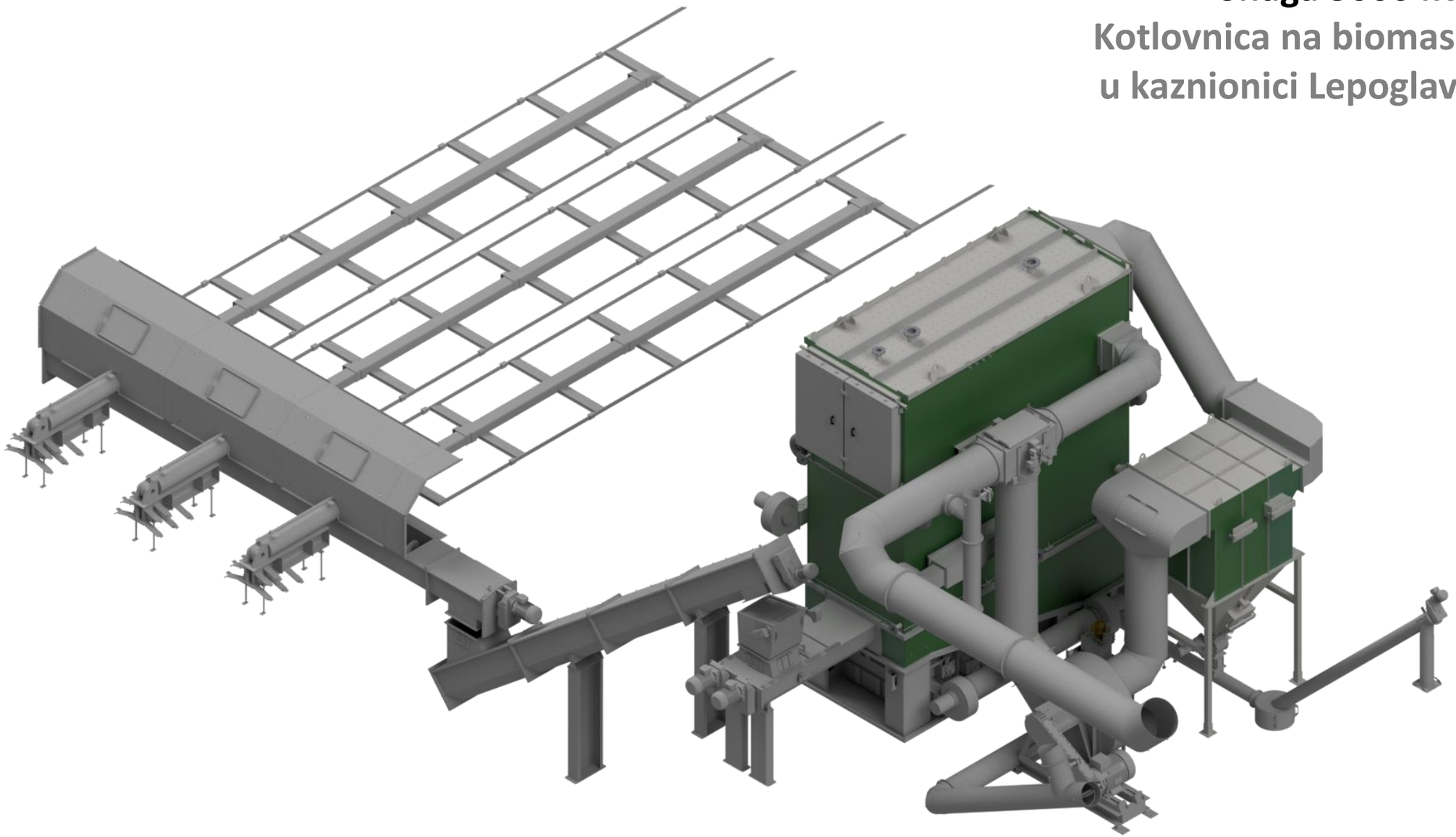
Kotlovnica na biomasu
u kaznionici Lepoglava

Montaža

Korištenje teške mehanizacije

Kaznionica Lepoglava

BINDER RRK 2500-3000
HR-42250 LEPOGLAVA
Snaga 3000 kW
Kotlovnica na biomasu
u kaznionici Lepoglava



ECOS - Vitez

BioMatic 350 BioControl
BiH-72250 Vitez
Kotlovnica na biomasu
Poslovna zgrada “ECOS”

Namjena:

radijatorsko, ventilokonvektorsko grijanje,
priprema PTV-a

T-DIZEL, Novi Travnik

Firematic 201 T-Control
BiH-72290 Novi Travnik
Kotlovnica na biomasu
Trgovački centar

Namjena:

radijatorsko, ventilokonvektorsko grijanje, solarni krug, priprema PTV-a

VNC nadzor rada

CARITAS, Banja Luka

Firematic 150 BioControl
BiH-78000 Banja Luka
Kotlovnica na biomasu
Poslovna zgrada “CARITAS”

Namjena:

radijatorsko grijanje i priprema PTV-a

DOM ZA STARIJE, Banja Luka

Firematic 301 T-Control
BiH-78000 Banja Luka
Socijalni centar Caritasa
biskupije Banja Luka “Ivan Pavao II.”
Dom za starije osobe

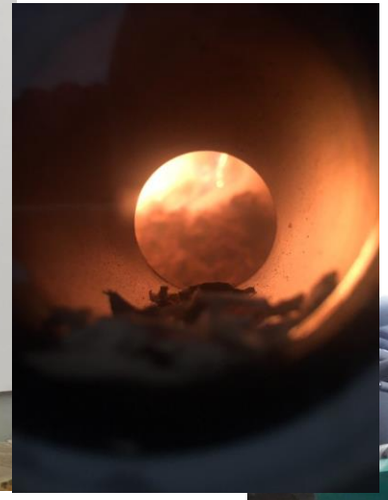
Namjena:

potrebe za toplinom centra

Postojeći kotao povezan na zajednički sustav automatske dopreme goriva

VNC nadzor rada

OŠ „SV. SAVA”, Bileća



Firematic 251 T-Control
BiH-89230 Bileća
OŠ „Sv. Sava”

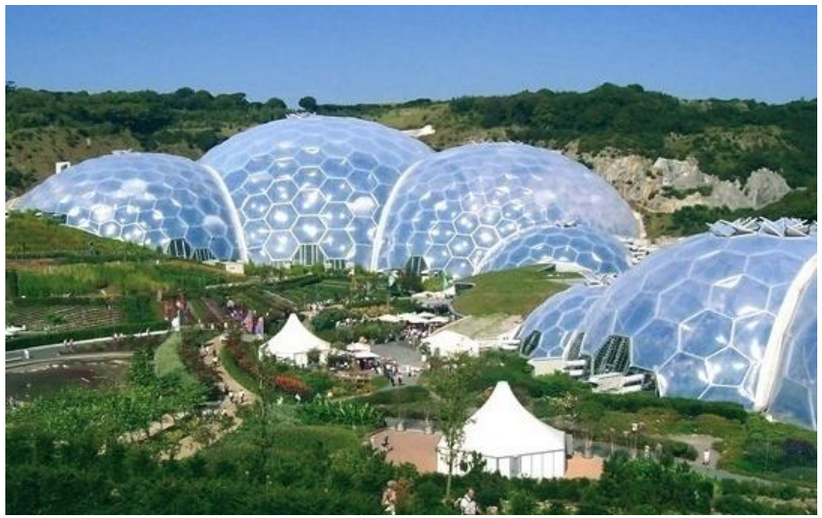
Namjena:

potrebe grijanja

i pripreme PTV-a

Gartenbau - Eden Project

- Engleska, plastenici
- Učin: 300 kW
- Gorivo: drvna sječka, biljni energetski nasadi
- Ušteda: ca. 50.000 l lož ulja
- 130 tona CO_2 /godina



VELUX

- Mađarska, proizvođač prozora
- Snaga: 2.200 kW
- Gorivo: Drvni otpad, ploče od iverice, MDF-ploče
- Ušteda: ca. 615.000 l lož ulja
  1,8 tona CO_2 /godina

L´Oreal

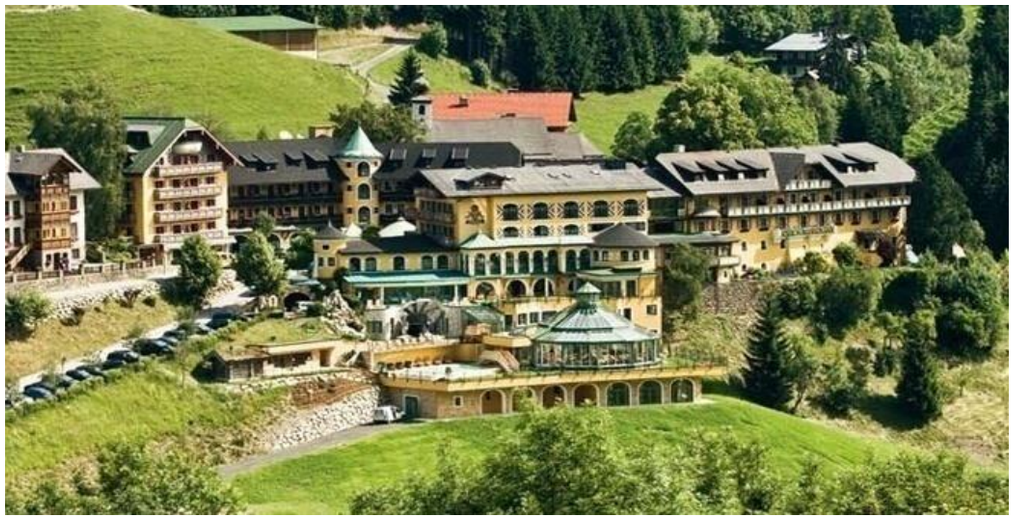
- Spanjolska, Industrija kozmetike
- Snaga: 500 kW
- Gorivo: peleti
- Ušteda: ca. 72.000 l lož ulja
  220 tona CO_2 /godina

Sunnyside Greenhouse

- Kanada, plastenici
- Učin: 6.000 kW
- Gorivo: drvena sječka, piljevina
- Ušteda: ca. 1.500.000 l lož ulja
  4.500 tona CO_2 /godina

Hotel Pichlmayr *****

- Austrija, wellnes hotel
- Snaga: 700 kW
- Gorivo: drvna sječka
- Ušteda: ca. 220.000 l lož ulja
  640 tona CO_2 /godina



Zotter Schokoladen

- Austrija, tvornica čokolade
- Tip kotla: kotao na zasićenu paru RRK 640-850
- Snaga: 840 kW,
- Gorivo: drvena sječka, kakao ljuska
- Ušteda: ca. 200.000 l lož ulja
  280 tona CO_2 /godina

Mahnbauer KG

- Austrija, sušenje kukuruza i sjemenki bundeve
- Tip kotla: kotao LWT
- Učin: 1.650 kW,
- Gorivo: drvna sječka
- Einsparung: ca. 100.000 l lož ulja
  267.000 kg CO_2 /godina

Toplana Tillmitsch

- Austrija, Toplana u Tillmitsch
- Snaga: 800 kW
- Gorivo: drvna sječka
- Priključeno potrošača: 1.700 kW
- Ušteda: ca. 100.170 l lož ulja / godini

Contractor Penz

- Bärnbach
- Snaga: 3.000 kW
- Gorivo: drvna sječka, životinjski gnoj (konjski)
- Ušteda: 2200 to CO_2 /godina

KRAJ - END

Hvala na pažnji!

Thanks for attention!

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