WeCo meltop UrbanGold recycling for a green future

COMBINED COMPETENCE UNDER ONE ROOF

Your partner for developing, designing, and realizing metal recycling projects

February 2022

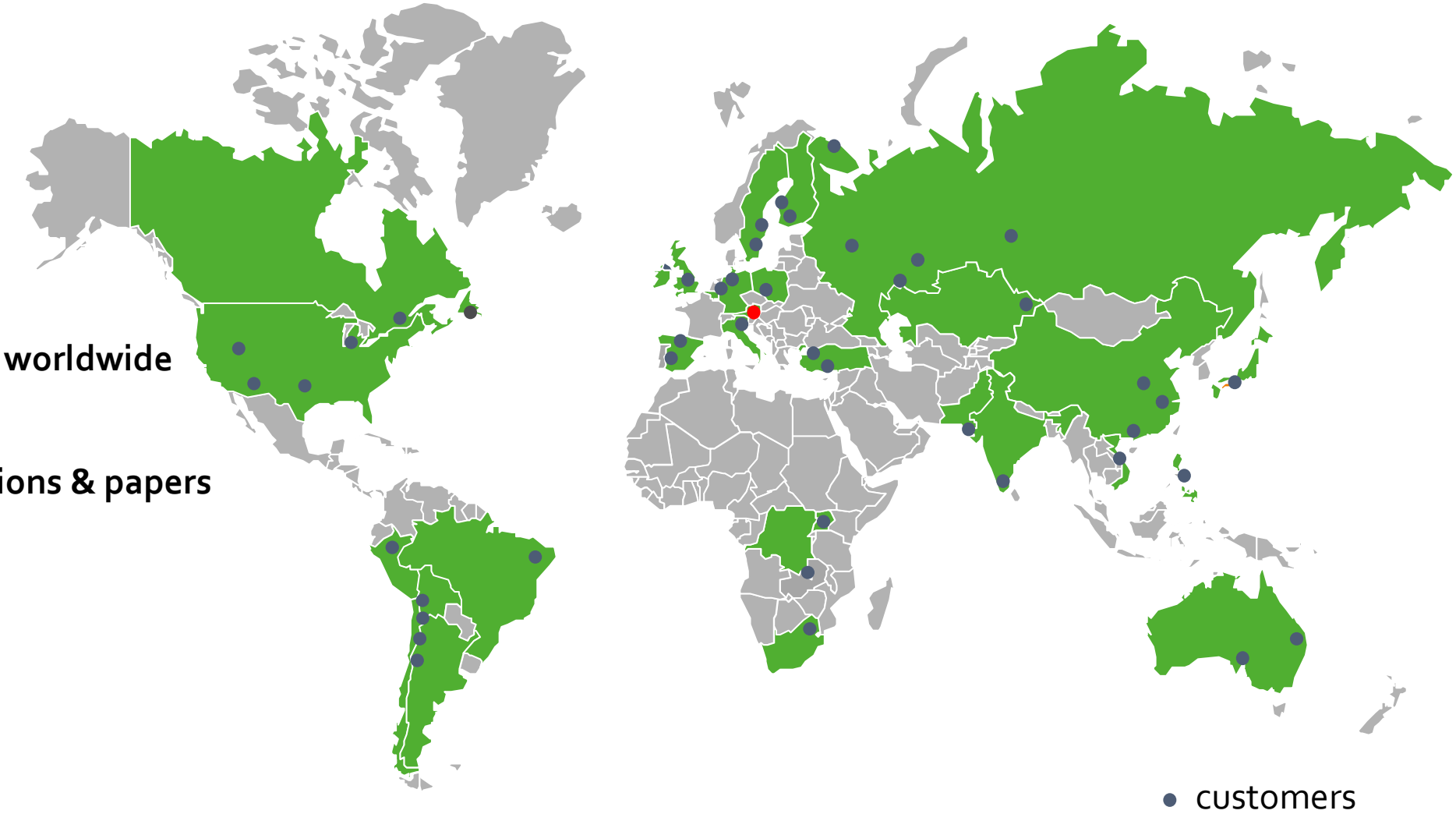
GLOBAL COMPETENCE

15 years experience

More than 100 projects worldwide

More than 200 publications & papers

3 active patent families

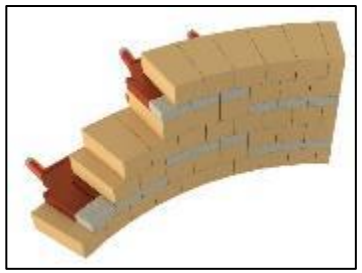


OVERVIEW PRODUCTS AND SERVICES

Non-ferrous metals units

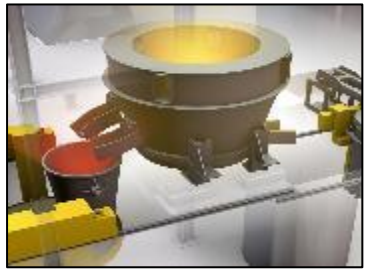
- TBRC
- HENRI ®
- Gas Purging Systems
- Coolers

ionicLife cast



Refractories non-ferrous

- 3D Engineering + supply
- CFD modeling
- HT-calculations
- EXP-calculations



UrbanGold Metal Recycling

- Process Design & Engineering
- Technical Project Management
- Consulting
- UG Technologies

Tankhouse technology

- METTOP-BRX ® Technology
- Cathode spacers
- Complete Tankhouse

ILTEC for vessel cooling

- IL-B2001 ©
- Ionic Liquid Technology for vessel cooling
- Furnace integrity optimization

Research & Development & Innovation

DigMet

mettop Academy

Overall Process & Technology Consulting

Field Studies & Trainings

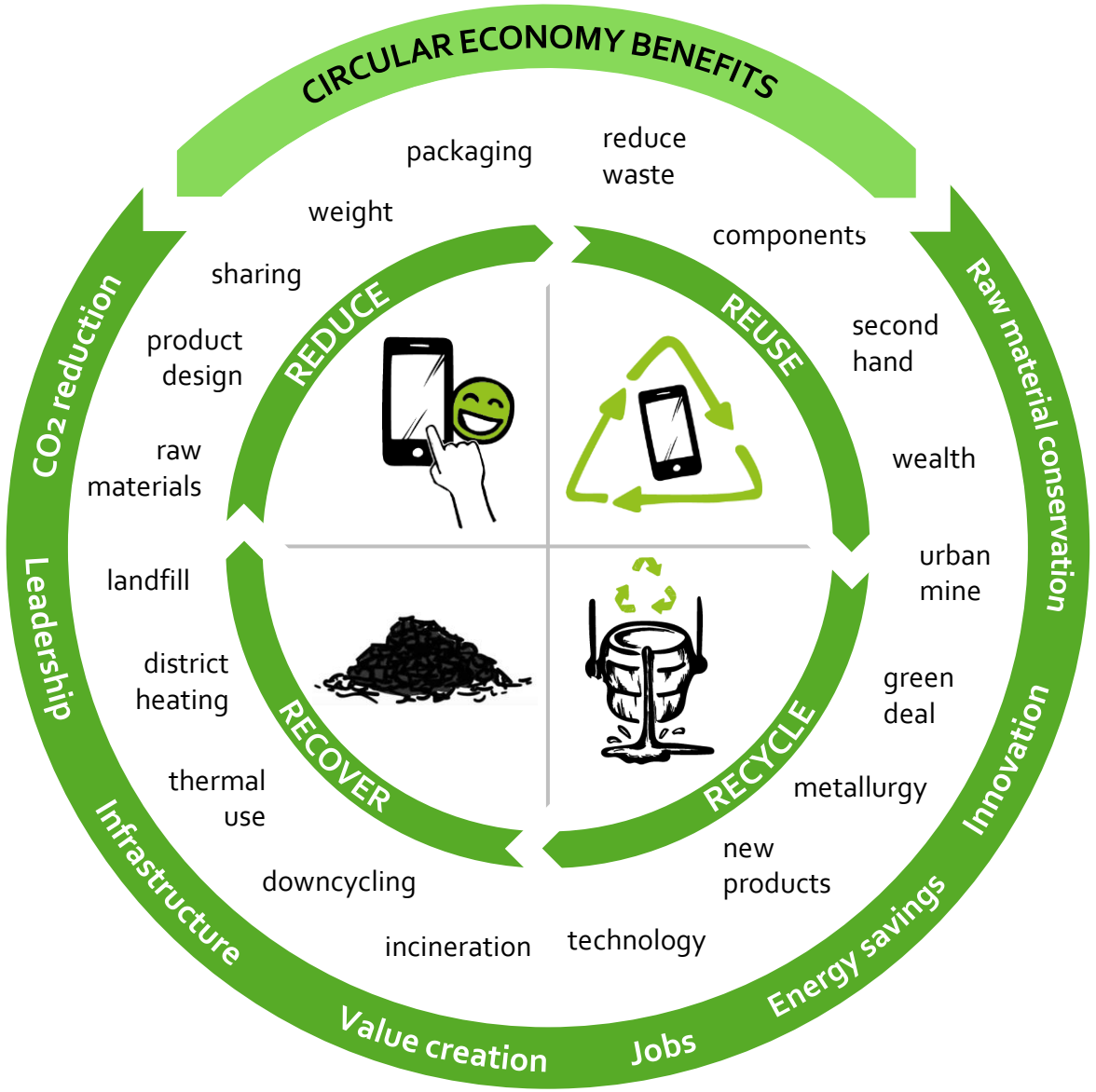
Process and 3D Plant Engineering

OUR CONTRIBUTION TO CIRCULAR ECONOMY

BENEFITS OF UG-TECHNOLOGIES

- **Sustainability**
  - Save energy and natural resources
  - Use carbon free technologies
  - Minimize waste and landfill
  - Reduce CO_2 footprint
  - Protect the climate
- **High tech and innovation**
  - Be a global leader
  - Use most modern technologies
  - Closed circuits for a smart city
  - Create value out of waste

THERE IS NO PLAN(ET) B!



WHAT WE OFFER

YOUR PARTNER FOR METAL RECYCLING

PROCESS DESIGN & ENGINEERING

- Technical & Economical & Environmental Feasibility
- Process Development
- Process Modelling
- Process Engineering

TECHNICAL PROJECT MANAGEMENT

- Engineering Services
- Interface Management
- Technical Advice & Coaching
- Ramp Up Support

CONSULTING SERVICES

- Fitness Check
- Recycling Process Optimization
- Metallurgical Advice & Coaching
- Studies

URBANGOLD TECHNOLOGIES

- UrbanGold HENRI
- UrbanGold Flex
- UrbanGold Compact

PROCESS DESIGN / PROCESS ENGINEERING

UrbanGold
recycling for a green future

YOUR CHALLENGE

- Lack of suitable recycling solutions for your waste / secondary raw material
- Lack of specialized know-how for prospects outside the core business
- Significant influence of legal framework and environmental regulations
- Demand for increasing recycling rate and/or energy efficiency

OUR OFFER

- Finding solutions for your waste stream / secondary raw material
- Process development for novel recycling solutions
- Process design for novel & established technologies
- Process calculations, process modelling, and mass & energy balancing
- Evaluation of technical, economical, and environmental feasibility

YOUR BENEFIT

- Customer tailored recycling solution optimized for your specific application & raw material
- Estimation of media, energy, and auxiliary consumption
- Prediction of products amount, quality, profitability

PROCESS DESIGN

PROCESS DESIGN / PROCESS ENGINEERING

UrbanGold
recycling for a green future

THE KING'S CLASS OF RECYCLING

End of Life Vehicles

E-Waste &PCB scrap

Catalysts

29 Cu | 46 Pd | 47 Ag | 82 Pb | 50 Sn | 30 Zn | 78 Pt

and many more

We are your partner for any kind of metal containing secondary raw material

Metallic scrap
Alloy scrap
Cable scrap

Slags, skimmings & dusts

Photovoltaic Systems

Batteries (e.g. Lithium Ion)

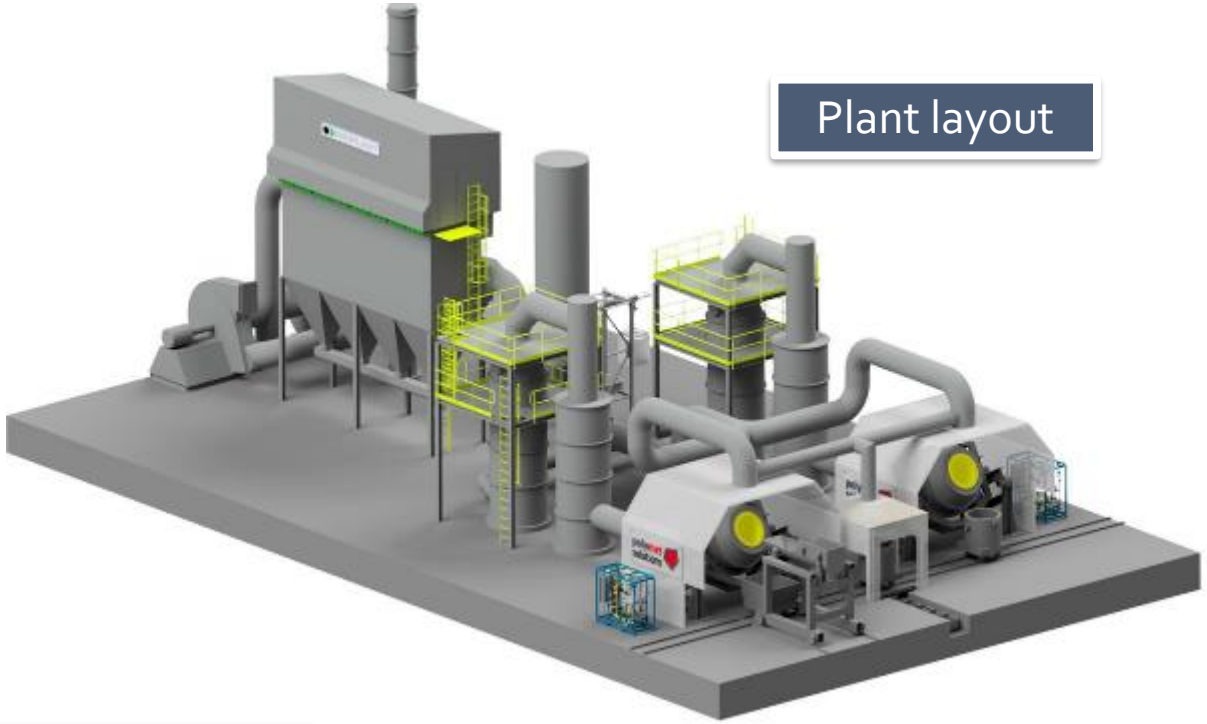
79 Au | 28 Ni | 3 Li | 26 Fe | 13 Al

PROCESS DESIGN

PROCESS DESIGN / PROCESS ENGINEERING

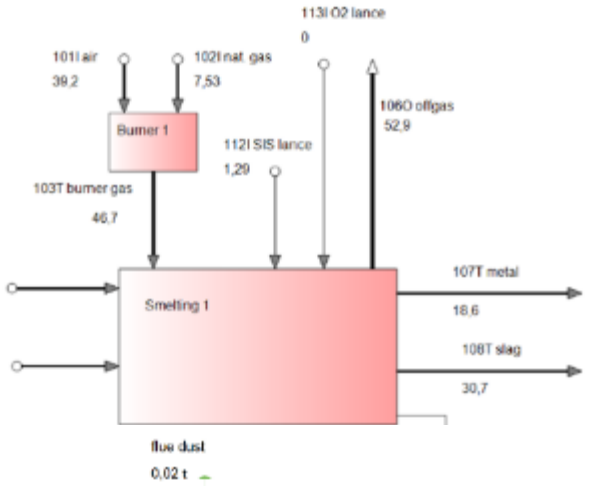
SMELTING & REFINING OF HIGH-GRADE COPPER SCRAP → REFERENCES

Plant layout



Refining slags		
Output Year	1 470	tpa
Output Batch	1 480	kg/batch
Ag	0,0000	wt.-%
Al2O3	1,0868	wt.-%
As2O3	0,0000	wt.-%
CaO	0,3381	wt.-%
Cr2O3	1,0471	wt.-%
Cu2O	24,2981	wt.-%
FeO	45,4430	wt.-%
MgO	0,0483	wt.-%
NiO	0,3412	wt.-%
P2O5	0,2335	wt.-%
PbO	0,3825	wt.-%
Sb2O3	0,0000	wt.-%
SiO2	25,3862	wt.-%
SnO	0,6574	wt.-%
SnO2	0,3809	wt.-%
TiO2	0,0000	wt.-%
ZnO	0,3569	wt.-%
Others, each	present	wt.-%
Total	100,00	wt.-%

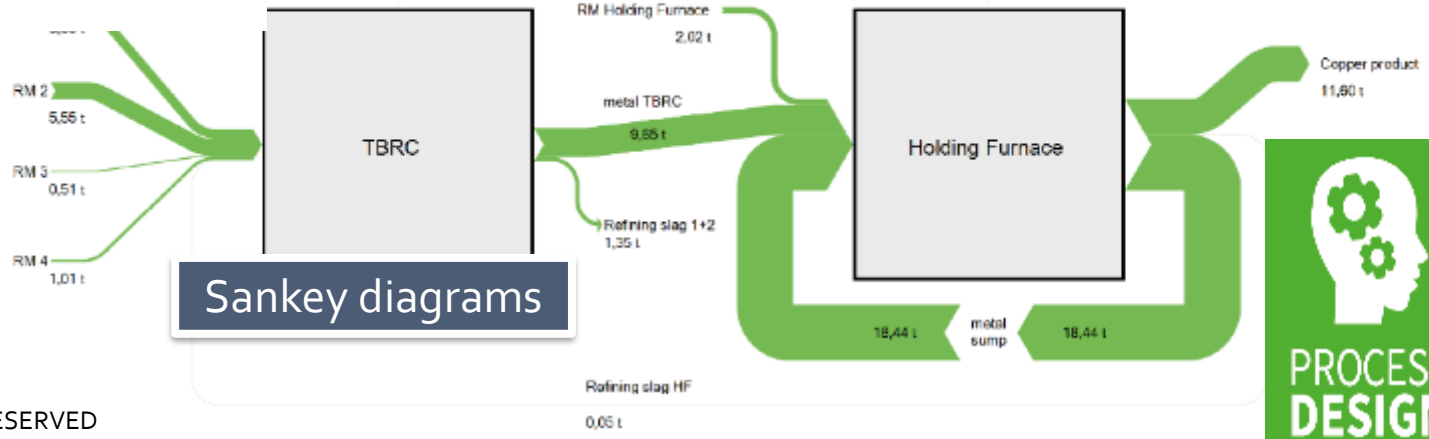
M&E balance



Process design

Step No.	1	2	3
Step Name	Smelting	Refining 1	Refining 2
Continuance of metal phase	remains	remains	HF
Continuance of slag phase	remains	removed	removed
Process time [h]	1,79	0,37	1,04
Burner lambda [-]	1,05	1,20	1,20
Bath Temperature [C°]	1.200	1.205	1.195
Fe/SiO2 ratio [-]	1,40	1,40	1,40
Oxygen in Metal [ppm]	1.500	5.000	8.000

Sankey diagrams



PROCESS DESIGN

TECHNICAL PROJECT MANAGEMENT

UrbanGold
recycling for a green future

YOUR CHALLENGE

- Lack of resources for planning, designing, and implementing new recycling processes
- Lack of specialized know-how for prospects outside the core business
- Need for independent third-party opinions
- Need for comprehensive knowledge covering a variety of facets

OUR OFFER

- Managing the project on your behalf – from pre-feasibility, engineering via construction to start-up and beyond
- Definition of project structure, work packages, and committees
- Comprehensive Project controlling and monitoring
- Consulting on all project phases

YOUR BENEFIT

- Comprehensive expertise from a single, independent partner
- Objective recommendations
- Best fit for the purpose: economical, technical, and environmental optimized solutions
- Cost effective project realization
- Consulting services included

TECHNICAL PROJECT MANAGEMENT

UrbanGold recycling for a green future

OUR SERVICES SUPPORTING YOUR PROJECT

Planning phase

Feasibility	Seed funding	Project development	Fund raising	Financial closing
Market study Concept study Technical & economical feasibility Technical advice	Business concept Preliminary financial plan Technical advice	Process- and layout engineering Facility design Tendering Technical advice	Business plan Technical advice References	Technical advice

Realisation phase

Construction	Cold test	Start-up	Operation	Continuous improvement
Support and monitoring Procurement advice Interface management Technical advice	Technical assistance	Metallurgical start-up Acceptance advice Technical advice	Metallurgical assistance Training and workshops Software packages	Consulting Studies

PROJECT MANAGEMENT

TECHNICAL PROJECT MANAGEMENT

SOME OF OUR REFERENCES

- Market study on regionally occurring scrap quantities and availability as a basis for the design of a recycling plant (Spain, 2018)
- Process engineering and consulting services for a WEEE recycling facility for a brownfield plant upgrade (Spain, 2019)
- Concept engineering and consulting services for a Greenfield secondary copper plant (USA, 2019)
- Consulting services and facility design for a Greenfield PCB recycling facility (Russia, 2020)
- Concept development, technical-scale test series, cost-benefit analyses, and consulting for processing of high-grade copper scraps (Germany, 2020)
- Concept development, raw material strategy, technical and economic feasibility, and consulting for a Greenfield WEEE recycling facility (United Kingdom, 2021)
- Concept development, raw material strategy, technical and economic feasibility for a Greenfield multi metal recycling facility (Austria, 2021)
- Consulting, workshops, and trainings in the field of slag metallurgy and processing of complex secondary raw materials (various projects)

CONSULTING SERVICES

YOUR CHALLENGE

- Need for comprehensive knowledge covering a variety of facets
- Uncertainty due to the lack of an outside view
- Personnel occupied with daily routine and focussed on established processes
- Difficulty to recruit skilled people and high staff fluctuation
- Need for independent third-party opinions

OUR OFFER

- Fitness Check: Deficiency and weak spot identification
- Process Optimization: Evaluation of process and equipment performance, quality level, and operational bottlenecks; recommendations for performance increase
- Metallurgical Advice & Coaching
- Studies

YOUR BENEFIT

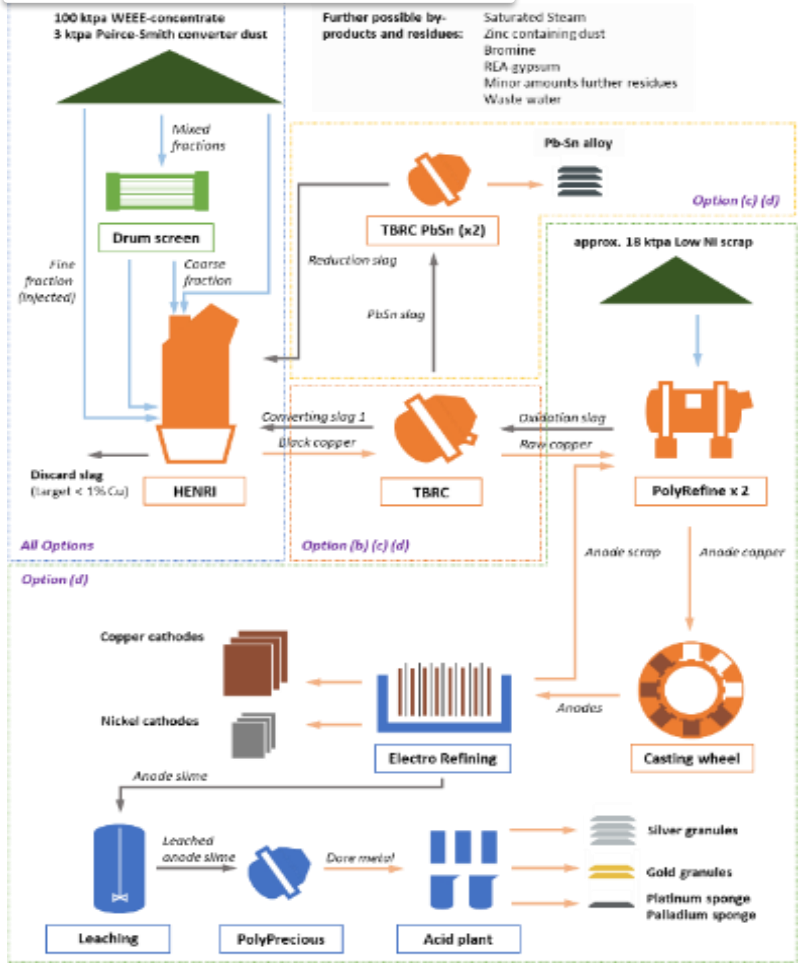
- Comprehensive expertise from a single, independent partner
- Objective recommendations
- In depth expertise and analysis
- Gaining a rapid and thorough basis for decision making
- Confidential cooperation
- Estimate ad state CAPEX & OPEX

CONSULTING

CONSULTING SERVICES

TECHNICAL ASPECTS

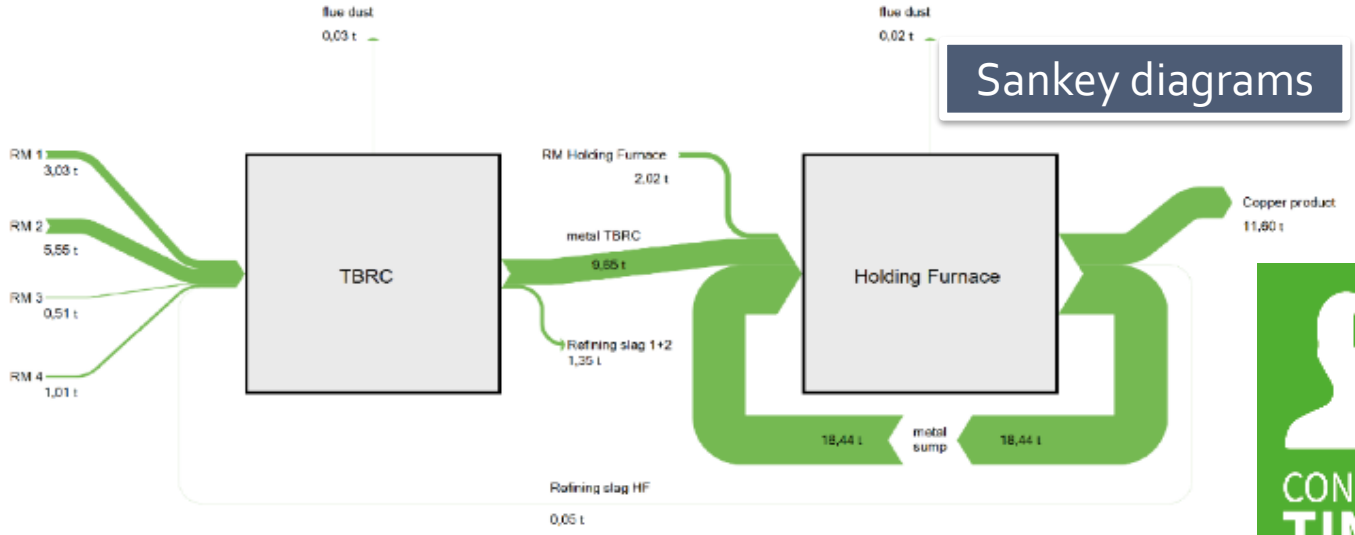
Process flow diagrams



Cost-benefit analysis

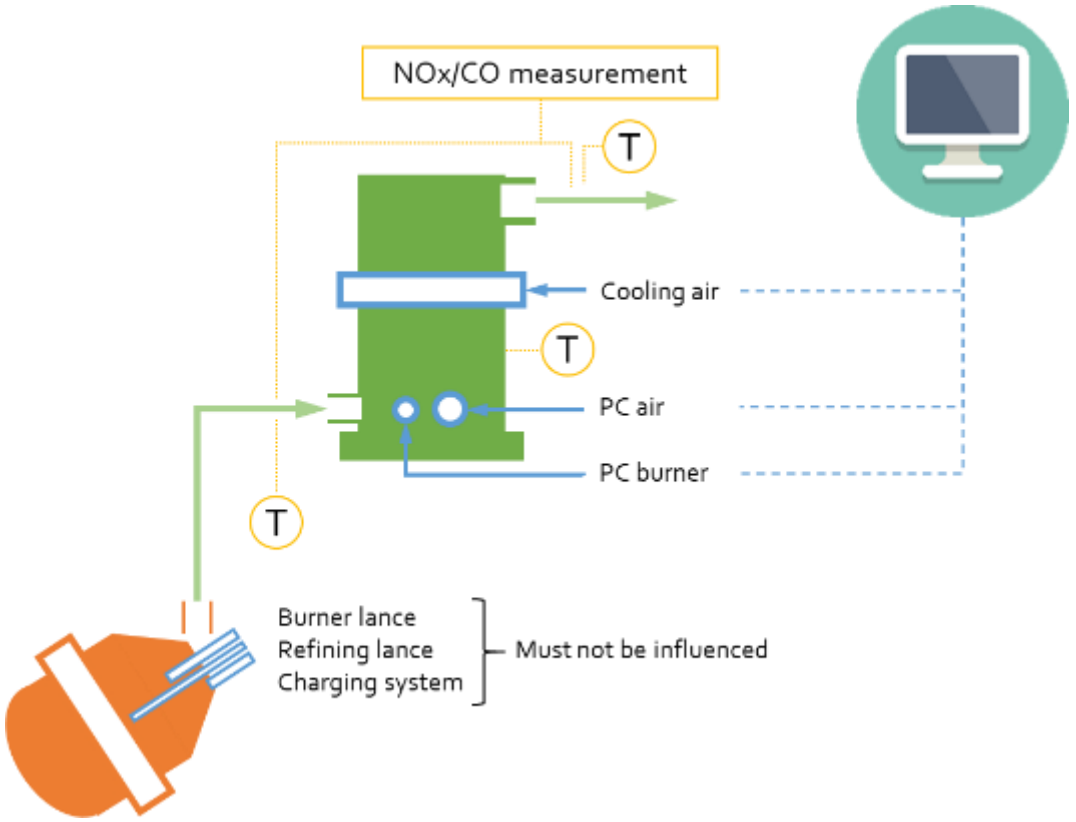
Nr.		Sekundärrohstoff	Wichtigkeit: 10 Notwendig	6 Sehr wichtig	3 Vorteilhaft	1 Gewünscht	Eignung: 10 Perfekt	7 Gut	4 Mittel	2 Schlecht	0 Nicht	W	max	Rohstoff 1		Rohstoff 2		Rohstoff 3	
1		Kriterien											460		2. 238		1. 280		3. 169
1	1	Wertstoff-Gehalt	> 70%	< 70%	< 25%	< 10%	< 1%					3	30	7	21	4	12	7	21
1	2	Wertstoff-Wert/to	> 10.000€	> 2.000€	> 500€	> 100€	> 0€					10	100	7	70	10	100	7	70
1	3	Problemstoff-Gehalt	Spuren	< 100 ppm	< 1000 ppm	< 1%	> 1%					6	60	7	42	7	42	4	24
1	4	Potentielle Wertschöpfung	> 50%	> 25%	> 15%	> 5%	< 5%					6	60	2	12	7	42	2	12
1	5	Aufbereitungsaufwand	Sehr niedrig	niedrig	mittel	hoch	sehr hoch					3	30	10	30	7	21	2	6
1	6	Umweltverträglichkeit	Sehr hoch	hoch	mittel	niedrig	sehr niedrig					6	60	7	42	7	42	2	12
1	7	Verfügbare Menge	Sehr hoch	hoch	mittel	niedrig	sehr niedrig					3	30	7	21	7	21	2	6
1	8	Komplexität der Verbindungen	sehr niedrig	niedrig	mittel	hoch	sehr hoch					3	30	0	0	0	0	2	6
1	9	Wettbewerbsintensität	sehr niedrig	niedrig	mittel	hoch	sehr hoch					6	60	0	0	0	0	2	12

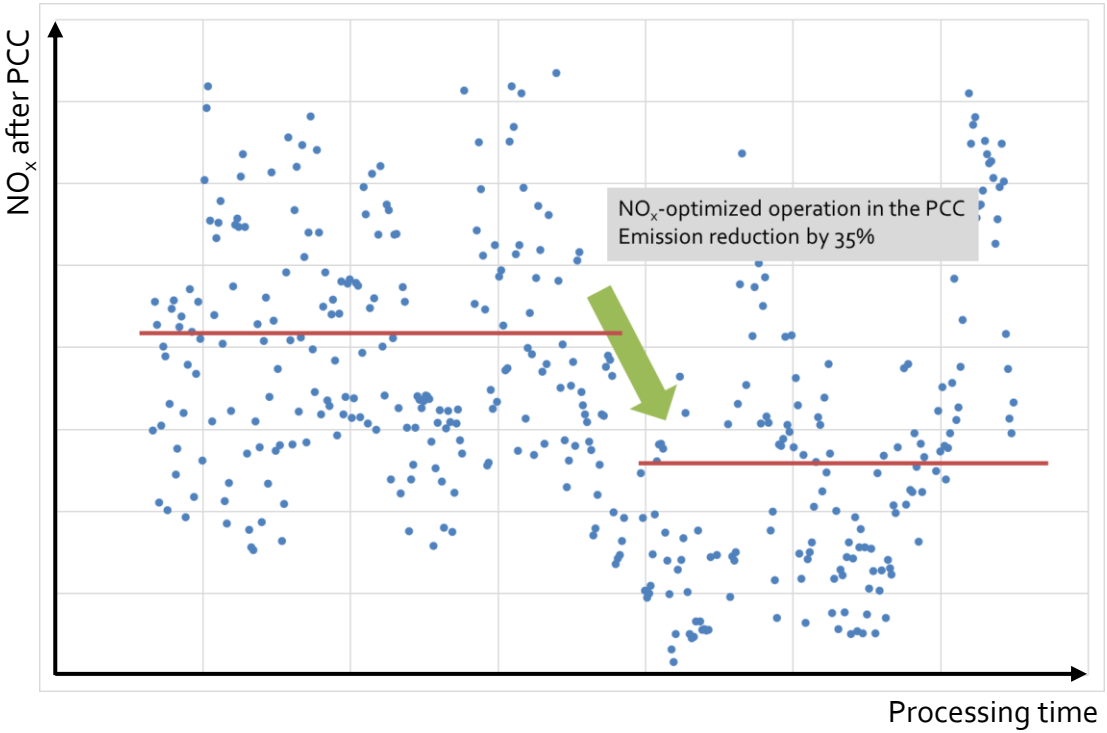
Sankey diagrams



CONSULTING SERVICES

EXAMPLE: NOX REDUCTION





NO_x-optimized operation of the PCC…

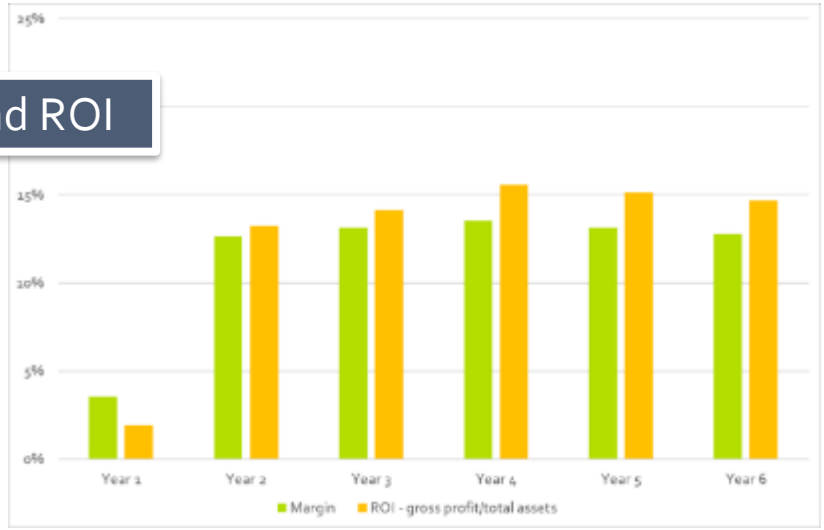
- Emission Reduction by up to 35 %
- Easier reaches emission limits
- Increases flexibility in metallurgical furnace operation
- Reduces the need for an SCR

CONSULTING

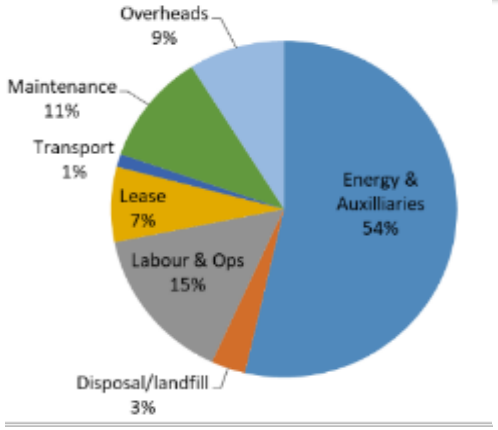
CONSULTING SERVICES

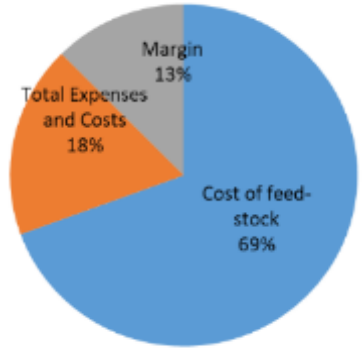
ECONOMIC ASPECTS

Margin and ROI



Breakdown of costs and revenues

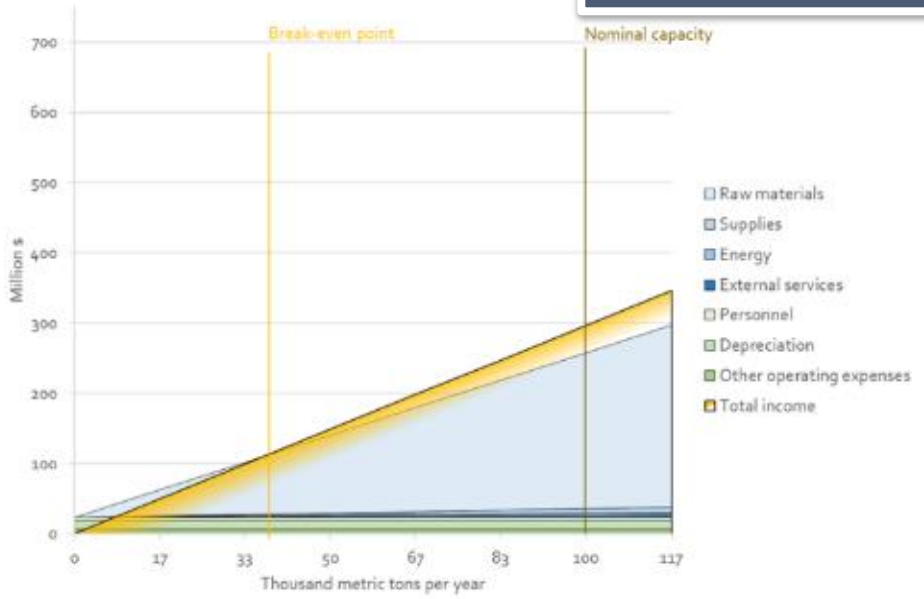




Sensitivity analysis

	Sensitivity	Influence gross profit	Payback time
Copper price	+ 10%	+ 4.1%	- 3.2 months
Gold price	+ 10%	+ 8.2%	- 6.6 months
Palladium price	+ 10%	- 4.1%	+ 3.3 months
Gold content	+ 10%	- 1.8%	+ 1.5 months
Palladium cont.	+ 10%	- 13.3%	+ 10.8 months
Yield	+ 0.5%	+ 3.8%	- 2.2 months
Discount	+ 5%	+ 7.8%	- 2.4 months
Energy	- 10%	+ 1.2%	- 0.8 months

Break even analysis



URBANGOLD TECHNOLOGIES

YOUR CHALLENGE

- Need for a most modern metallurgical e-waste recycling technology
- Need to process a big variety different metal bearing qualities
- Need to minimize losses, achieve marketable by-products, and maximize economic results
- Need of state-of-the-art environmental solutions
- Need of a partner with comprehensive knowledge

OUR OFFER

- A comprehensive technical solution with latest, but already established technologies
- Highly specialized smelting vessels with modular design for numerous applications and raw material mixes
- A metallurgical process to handle all possible impurities and to maximize metals yield
- An economical attractive production within a wide range

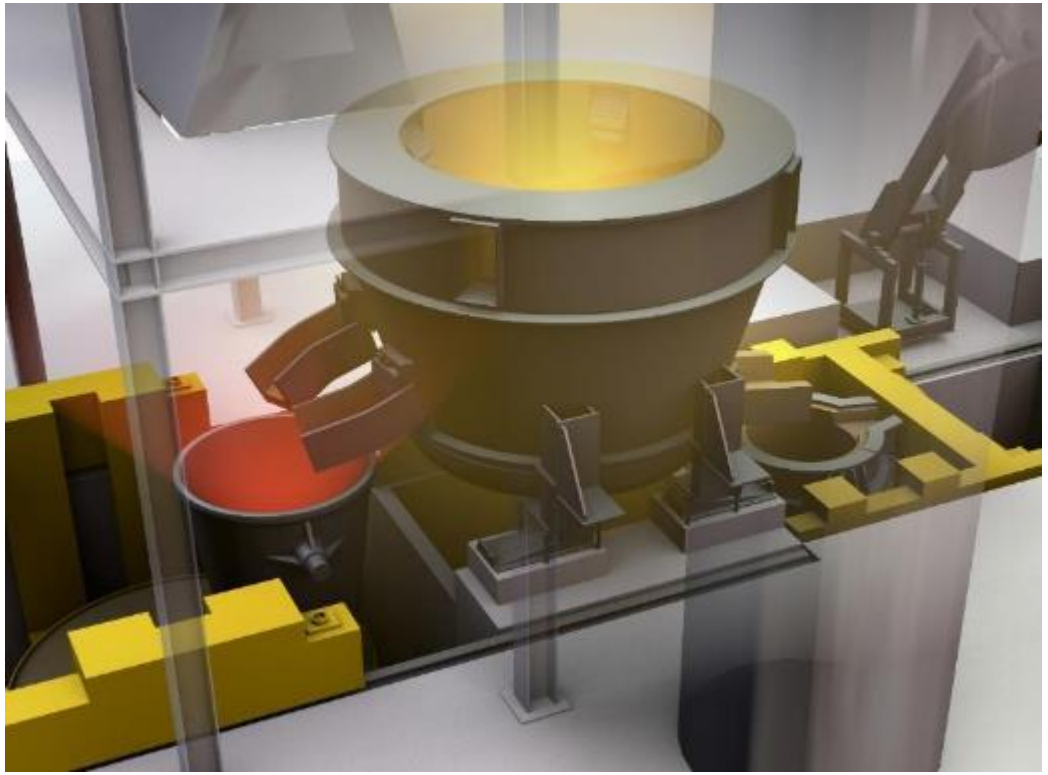
YOUR BENEFIT

- A customer tailored design for your individual application
- A comprehensive solution from metallurgical experts
- The recycling process as key to a successful and economical attractive operation
- Included consulting services for all content related topics, e.g., feed stock, permitting, infrastructure (…)

URBANGOLD TECHNOLOGIES

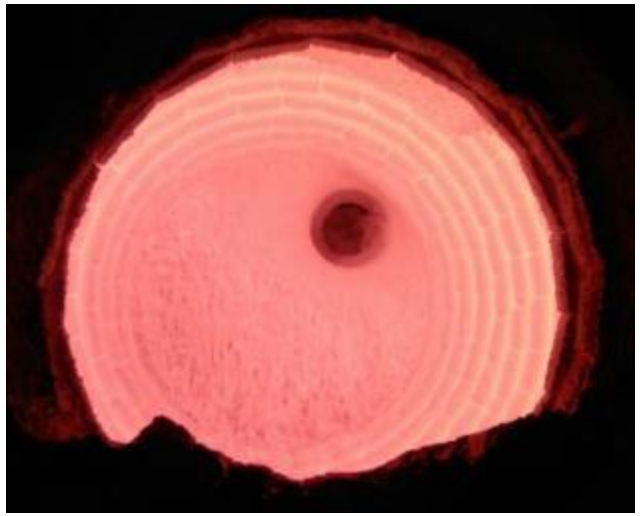
READY TO GO

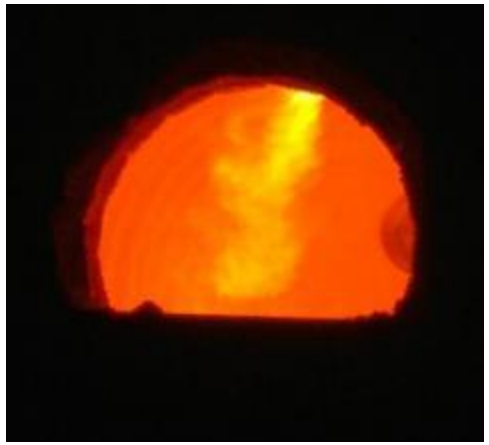
- For e-waste recycling, we can offer our **ready developed technologies**
- Depending on your actual feed stock you can choose between **three options:**
  - **UrbanGold compact** for PCB scrap recycling
  - **UrbanGold classic** for fractions with lowest copper and precious metals content
  - **UrbanGold flex** for highest possible feed stock flexibility
- Core of the flex and classic technology is our patented **HENRI** smelting furnace



URBANGOLD TECHNOLOGIES

HENRI SMELTER





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