Not only product supplier but also Solution provider

Engineered for a Sustainable Future

Alleima’s Latest Innovations in Advanced Metallurgy & Solutions

Alleima

Safety first

At Alleima our objective is zero harm to our people, the environment we work in, our customers and our suppliers.

Protective equipment

Emergency number

Psychological safety

First aid kit

Emergency exit

Alarm

Assembly point

Health & well-being

Speak Up

A world-leading advanced materials company

High value-added products in advanced stainless steels and special alloys as well as products for industrial heating

Revenues	Recycled steel	Originates from	Employees
18,630	81%	1862	~6,800*
SEK M, 2025	in products		

Sales

>80 markets

5 R&D centers

40+ sales offices

25 production sites across the globe

*Total workforce includes employees and third-party workers and is based on full-time equivalents.

Customer segments


Industrial


Chemical and Petrochemical


Oil and Gas


Industrial Heating


Consumer


Nuclear

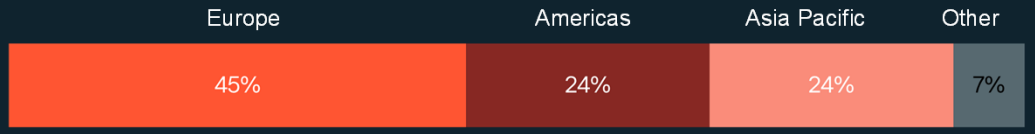

Mining and Construction


Transportation


Medical


Hydrogen and Renewable energy

Revenues by geography



Sustainable steel

—We aim to include sustainability in every aspect of our business. For us that means integrating sustainability throughout the entire value chain – from research to final product.

At the Alleima site in Sandviken, we use electricity made from

100%

fossil free sources

Over

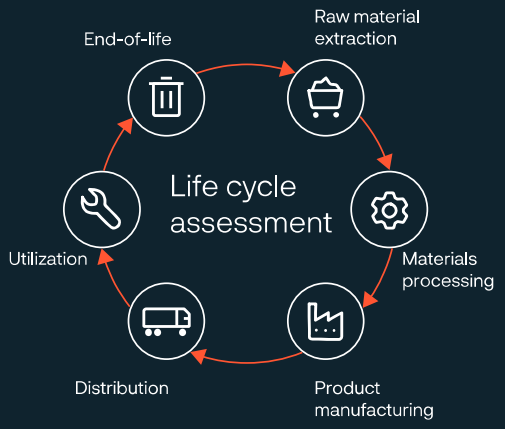
80%

of the material used in our products originate from recycled scrap

Life Cycle Assessment (LCA)

— Supporting our customers on their journey to reduce their carbon emissions.

— LCA is quantification of carbon footprints from raw material to end product.



Long term sustainability targets

— SBTi: Net Zero latest by 2050

— Reduce Scope 1 and 2 CO_2 emissions with more than 50% by 2030

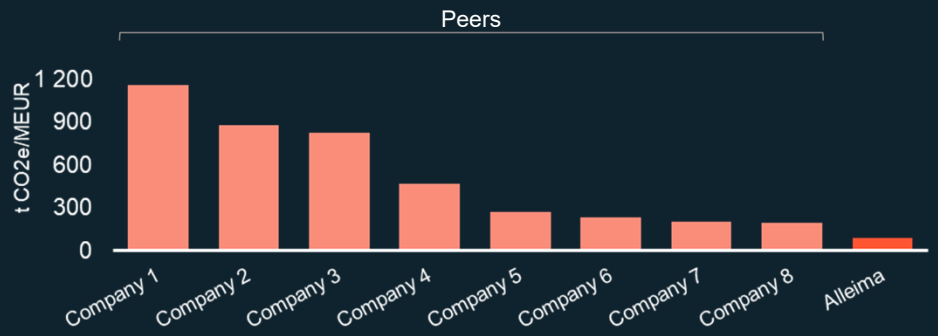
— 83% recycled steel in finished products by 2030

— 76% waste circularity, excluding slag by 2030

— Research, test and implement projects in order to move slag to circular waste streams

A sustainability frontrunner

Low greenhouse gas intensity compared to peers



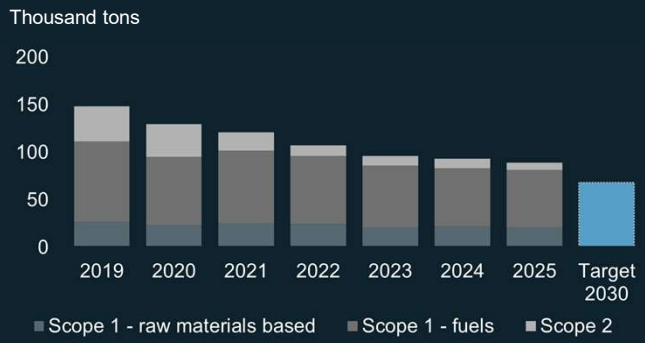
Note: peers' process based on blast furnace process. Includes Scope 1 and 2.

From scrap to product

Scrap steel

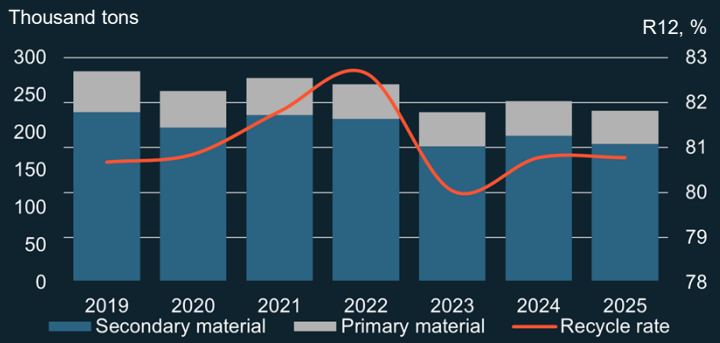
Alleima products

Climate - CO_2 emissions



Target to reduce Scope 1 and 2 CO_2 emissions by more than 54% by 2030, compared with 2019.

Circularity - high degree of recycled steel



Target to have more than 80% recycled steel in manufactured products.

A premium product offering

As a world-leading developer and manufacturer of advanced stainless steels and special alloys, as well as solutions for industrial heating, we make industrial processes more efficient, profitable and sustainable.

Tubular products
56%

Bars & billets
17%

Heating technology
17%

Precision strip steel
8%

Medical wire
2%

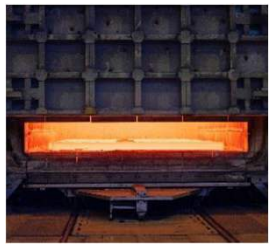
Coated steel strip
< 1%

Advancing industries through materials technology

Industrial
- Solid round bar and hollow bar
- High pressure tubing
- Composite tubing
- Wear resistance strip

Chemical and petrochemical
- Fertilizer tubing
- Hydraulic and instrumental tubing
- Heat exchanger tubing

Oil and gas
- Umbilical tubing
- Control lines
- Oil Country Tubular



Industrial heating
- Metallic heating elements
- Ceramic heating elements
- Radiant Kanthal® APM / Kanthal APMT® tubes
- Diffusion cassettes

Consumer
- Compressor valve steel
- Stainless knife steel
- Razor blade steel
- Appliance wire

Power generation
- Steam generator tubes
- Cladding tubing
- Nuclear tubes and pipes
- Strip steel spacers

Mining and construction
- Rock drill steel

Transportation
- Titanium and stainless steel tubes
- Gasoline Direct Injection (GDI) tubes
- Compressor valve steel
- Shock absorber steel

Medical
- Medical precision wire
- Medical tubing
- Medical strip

Hydrogen and renewable energy
- Coated strip steel for fuel cells
- High pressure tubing for hydrogen applications
- High nickel alloy tubing for concentrated solar power applications

Materials innovator and technology leader

— R&D team focused on evolutionary refinements, expansion of existing portfolio as well as product innovation to capitalize on the on global mega trends

— Scope of R&D objectives extends beyond products – unique ability to innovate along whole value chain, incl. process and manufacturing

How we win, today and tomorrow

Customer partnerships | Relationship with academia

Shared R&D platforms | Application specific R&D

↓

Products focusing on growth industries | Defend core | Widen materials portfolio

# Active recepies	# Patents	# FTE:s Dec 2021	R&D % sales '19-21
>900	~850	230	1.5%

Examples of new products

Megawatt process gas heater, which is developed to heat hydrogen up to 1,000 degrees Celsius

Next generation of compressor valve steel. Freeflex is a hardened and tempered martensitic stainless compressor valve steel alloyed with copper.

New super austenitic high strength steel with high structure stability to simplify welding and heat treatment.

Fully integrated value chain

Control of the supply chain from R&D to final product.

— Ensure independence
— Industry-leading technology
— Secure product quality
— Prerequisite for new materials and product development

Customer need identification


Research & Development


Primary Melting


Hot Working


Cold Working

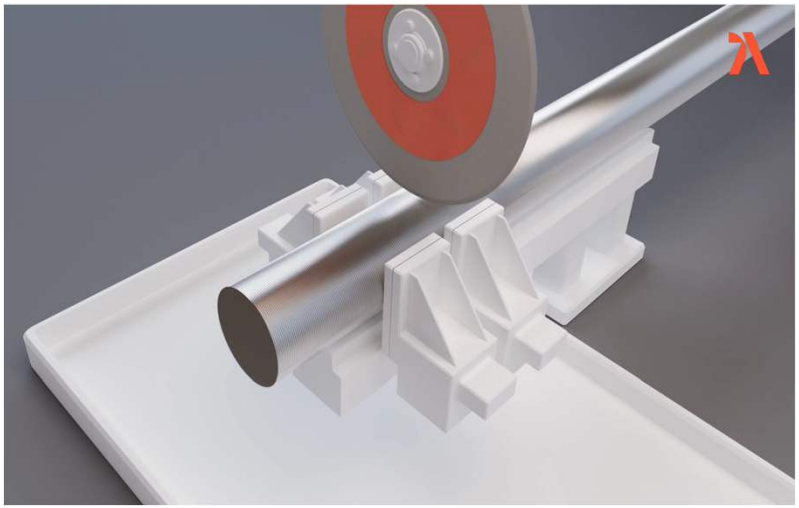

Finishing


Sales & Marketing

2 Tube Manufacturing

Hot extrusion

- Latest Technology
- Impurities from core removed with 20% loss of material ensures defect free product
- Lubrication in ID & OD during extrusion, results in low friction.
- Induction heating of billet results in negligible scaling.
- Compression forces resulting in fine grain defect free micro structure.
- Uniform thickness through the length.



Hot piercing

- Older method
- No Material removal hence more defect on ID
- Difficult to process high alloyed grades/high deformation resistance
- No Lubrication between mandril and billet results in high friction causing wear & tear on mandril.
- Gas fired rotary furnace heating resulting in heavy scaling, carburization and sulfer impregnation.
- Shearing forces results in cracks & lamination in ID
- Higher time in piercing might result in temperature drop of billet during process and defect creation.
- Thickness variation though out the length.

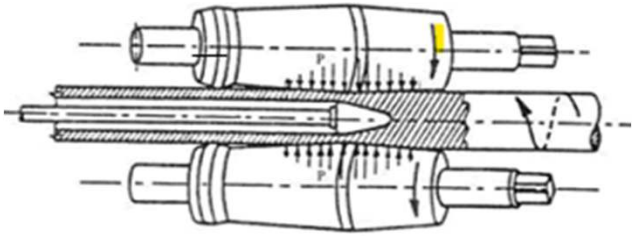


Figure 11: Accelerated plug wear

Defect from Production – Piercing method

Complete range of Austenitic, Duplex, high-alloy austenitic stainless steel, nickel, Titanium, Zirconium and Bi-Metallic

Austenitic Stainless Steels	
Alleima® 3R12	304L/304
Alleima® 3R60	316L/316
Alleima® 3R65	316L (Ni, Mo)
Alleima® 3R64	317L
Alleima® 5R10	304/304H
Alleima® 6LR62	316/316H
Alleima® 6R35	321/321H
Alleima® 6R44	347/347H

Duplex Stainless Steels	
Alleima® 3RE60	S31500
SAF™ 2205	S31803/ S32205
SAF™ 2304	S32304
SAF™ 2507	S32750
SAF™ 2707 HD	S32707
SAF™ 2906	S32906
SAF™ 3006	S83071

High Alloyed Austenitic and Nickel	
Sanicro® 70	Alloy 600
Sanicro® 625	Alloy 625
Sanicro® 69	Alloy 690
Sanicro® 41	Alloy 825
Sanicro® 35	N08935
Sanicro® 28	N08028
Alleima® 2RK65	N08904
Alleima® 254 SMO*	S31254
Sanicro® 276	N10276
Ni200/201	N02200/201
C22	N06022

Ti, Zr & Bimetallic	
Titanium	Pure titanium and titanium grades: 1, 2, 3, 7, 9, 11, 12, 16, 17, 26 and 28
Zirconium	Zirconium 702 (ZR-702)
Bi-metallic	ZR-702 / 2RE69

Alleima

Solution to specific problem

Grade	Application
Sanicro 35	Speciality Chemical /Sea Water Application / Versatile Grade
SAF 2906	Sulphuric Acid, Urea Carbamate Condenser / Stripper
SAF 3006	Organic - Inorganic Acids & Caustic Services
SAF 2707 HD	High Chloride/Bromide Services with acidic conditions , Sea Water Applications
High Ni grades 200/201/C276/C-22	Critical application in chemical Industry
Alleima 2RE69	Urea carbamate Condenser / MPDC
Bimetallic tubes	Urea Striper
Alleima SX	Concentrated Sulfuric acid
Sanicro 28	Phosphoric Acid
Alleima 2RE10	Nitric Acid
Alleima 253MA & 353MA	High temperature

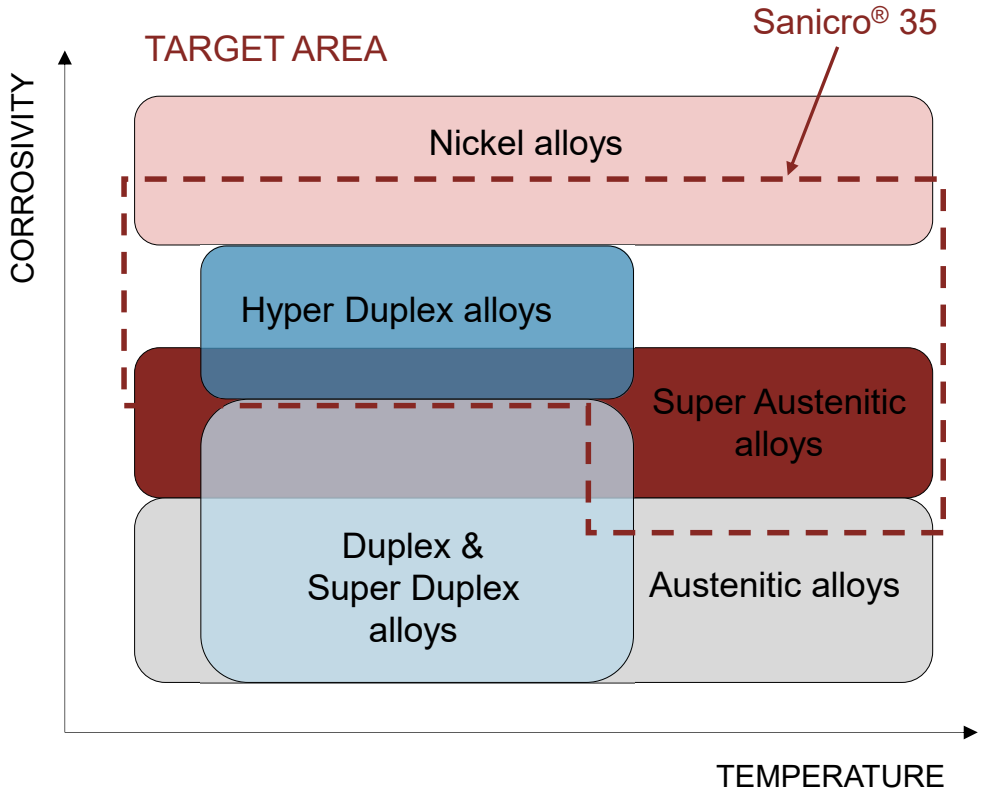
3 New Corrosion Resistance Alloys

- Sanicro 35
- SAF 3006
- SAF 2906

4 Sanicro 35

Material Selection

— Carbon steel
— Admiralty brass/Cupronickel
— Low alloyed Stainless Steels
— Duplex Stainless-steel family
— Sanicro® 35
— Nickel alloys



Sanicro® 35 – UNS N08935

Chemical composition (nominal)%

C	Mn	P	S	Si	Cr	Ni	Mo	Cu	N	Fe
0.030	1.2	0.030	0.020	0.5	27	35	6.5	0.4	0.3	Remainder

PREN:
52

- Balanced chemistry
- High structural stability

Standards/Approvals

- ASTM B163
- ASME code case 2982. Boiler and pressure vessel code, section VIII, division I and II.
  - 550°C
- Particular material appraisal (PMA), TÜV file 1326W043219
  - 450°C

5 Sanicro 35
Installation examples Across Industry

Sanicro® 35 – Applications – Chemical Industry

Application	**Soda ash plant WLDS preheater**
Location	India
Product	Ammoniacal liquor & gas
Service conditions	Tube side: Ammoniacal gas NH3 +Co2+N2+02+H2o Shell side: Ammoniacal Liquor Sodium + Sulphide+Amonia Tube Side Temp- 88-95 C Shell Side Temp-35-45 c
Previous experience	Earlier constructions using Ti Grade 2 have shown pitting corrosion over time. The customer tested a San35 coupon and found it to perform better than Ti Grade 2.
Sanicro® 35	Installed and running successfully for 1 year (Installed in 2024) without any failure since installation

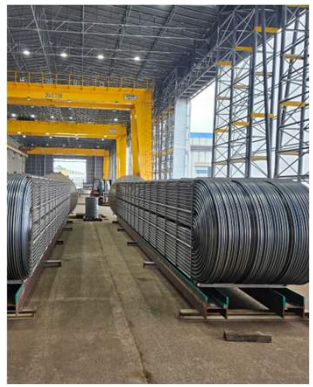
Installation in Formic acid

C22
- Order booked: Dec2021
- New plant
- Size&quantity: 64 tons of U bended tubes, 19.05 x 2.11 M/W x 22 M

San35
- Order booked: Jan2023
- Old plant maintenance
- Size & quantity: 20tons of U bended tubes, 25.4*2.11mm

Equipment name: Waste Heat Recovery Boiler

Background:
- Application: Formic Acid
- Customer in Asia
- Service condition:
  - Tube side: Formic acid + water
  - Shell side: water &steam
- Background:
  - Old plant experience guide the new plant material selection
  - Material selected
  - 2507→904→C22
  - Lifetime of 2507 in the old plant just 10 years, upgrade to sanicro35(aim to have 20-year design lifetime)
  - 904L in the old plant failed / 3yrs.



5 SAF 3006
Super Duplex Stainless Steel optimized for general corrosion Resistance

SAF 3006

Duplex stainless steels (DSSs)

- Pitting and crevice corrosion
- Mechanical strength
- Chloride SCC resistance
- Thermal expansion close to CS

Often optimized for high chloride resistance, and therefore the performance in acid environments can be limited

SAF™ 3006 (UNS S83071)

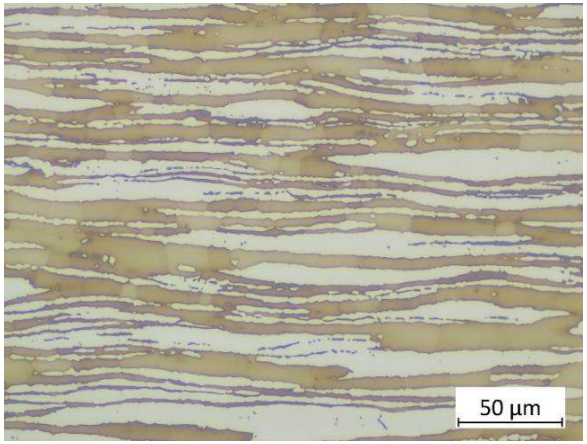
- All benefits of traditional DSSs
- Optimized for general corrosion resistance

SAF™ 3006 – Chemistry and structural stability

Chemical composition (nominal)%

UNS S83071

C	Si	Mn	P	S	Cr	Ni	Mo	N	Fe
≤0.030	0.2	1.0	≤0.030	≤0.015	30	7	3.2	0.35	Remainder



Balanced composition
Good microstructural stability
Equal amounts of Austenite and Ferrite.

Standards/Approvals

- ASTM SA 789 / SA 790
- ASME code case 2914. Boiler and pressure vessel code, section VIII, division I and II.
- Particular material appraisal (PMA), TÜV file 1326W221701

Comparison in different media

	SAF™ 3006	SAF™ 2707 HD	SAF™ 2507	904L	SAF™ 2205
Hydrochloric acid (HCl)	+++	++	0	−−−	−−−
Sulfuric acid (H_2SO_4)	++	+	0	−	−−
Sulfuric acid with chlorides (2000 ppm)	++	+	0	−−	−−−
Formic acid (HCOOH)	+++	++	0	−−	−−
Nitric acid (HNO_3)	++	0	0	−−	−
Sodium hydroxide (NaOH)	+++	0	0	−	−−
Pitting resistance	++	+++	0	−−	−−

SAF™ 3006 – Applications

- Caustic evaporators.
  - Excellent corrosion resistance in caustic environments.
  - Superior erosion resistance compared to Ni200.
  - Cheaper than Ni200 and Ni201.

- Sulphuric acid cooler.
  - Good resistance towards sulphuric acid.
  - Good resistance towards chlorinated seawater.
  - Cheaper than austenitic alloys.

- Organic acids.
  - High chromium and molybdenum content gives good resistance towards organic acids.
  - Pitting resistance protects against impurities such as chlorides and bromides.

- Refinery condensers.
  - Better resistance towards hydrochloric acid dew point corrosion than super duplex.
  - Excellent pitting and crevice corrosion resistance.

6 SAF 2906

SAF 2906

Applications

- Typical applications for SAF™ 2906 are:
  - Urea production: the material can be used successfully for all components in the urea plant, such as stripper tubes, condenser tubes, high-pressure piping etc.
  - Caustic soda production: the material is suitable for use in piping systems from the cells up to the evaporation plant. It is also an excellent choice for very aggressive conditions, such as the evaporator tubes, in both diaphragm and membrane process.
  - Alumina production: heat exchanger tubes and piping in the digestion of alumina
  - Environments where high resistance to pitting and crevice corrosion is required

HOW TO AVOID RECEIVING POOR QUALITY MATERIAL?

BY SPECIFYING WHAT YOU WANT TO BUY

MANUFACTURING, QUALITY CONTROL AND DELIVERY TESTING GUIDELINES

Chemistry:

- ASTM A789 ranges for Cr and Mo are 24-26 and 3-5% respectively, but Cr and Mo contents above 25 and 3.8%, respectively, ensure good properties
- low levels of impurities (C<0.025 and S< 0.015) are ensured by adopting the Electric Arc Furnace route (EAF) followed by Argon Oxygen Decarburization (AOD) and Ladle refining process.

Manufacturing Process:

Hot working process flow of hot extrusion followed by cold pilgering or drawing ensures a defect-free and better-quality product compared to hot piercing.

Corrosion Resistance:

- A minimum PREN value of 42.5 would ensure the highest resistance against pitting corrosion
- ASTM G48 Method A test at 50°C (maximum weight loss < 0.5 gm/m^2) (Pitting corrosion check)
- ASTM A 923 Practice C, at 40°C for 24 hours and maximum weight loss should be < 5 mdd (Pitting corrosion check)
- ASTM G48 B or G78 (Crevice corrosion check)
- ASTM G36 (Stress corrosion check)

Other Quality Control:

- ASTM A1016 (Eddy current check)
- 100% PMI should be conducted on finished tubes on each lot
- Hardness Level should be max 30 HRC
- Roughness Value (Ra) at OD ≤1.5 µm, and at ID ≤1.0 µm in as-pickled condition

VALUE ADDED SERVICE

ALLEIMA SOLUTION

- Failure analysis
- Coupon test or tube sample
- Support decision making in material selection

Points to be noted while buying tubes

— Raw material source
— Tube production process – Hot extrusion followed by cold pilgering
— Chemical composition – Higher side of the range specified in ASTM standard is better
— Delivery corrosion test – IGC test, ASTM 923C for duplex, ASTM G48 tests etc
— PREN number

Thank you
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