



# OIL AND GAS APPLICATIONS

STAINLESS STEEL AND HIGH NICKEL ALLOYS SEAMLESS TUBULAR SOLUTIONS



# Tubacex: A global technological partner for oil&gas applications

Continuous innovation during the last 30 years has allowed the Companies of the Tubacex Group to become world leaders in the supply of seamless tubes made of stainless steel and nickel alloys to Oil&Gas Companies, fulfilling the tightest requirements.

The Tubacex Group has become one of the main suppliers of Seamless Stainless Steel and Nickel alloy tubes for the Oil&Gas industry. Our integrated production process is comprised of a steel making plant, 3 extrusion presses and more than 20 cold pilger mills and draw benches that allow us to supply tubes for different Top Side, Onshore and Upstream applications. The Oil&Gas industry is a keystone in the Tubacex strategy.

Our organization and investments are continuously being adapted to the growing hostile conditions that Companies of this sector are facing everyday. These new challenging corrosive environments and applications are driving us to implement in our mills the most advanced verification equipment and inspection procedures for the production and control of tubes for downhole, sub-sea, umbilical,... purposes.

Worldwide presence Through our commercial offices

**Competitiveness** Thanks to our lean manufacturing process

**Service** Cooperation with or customers

Flexibility In materials chemical composition & deliveries

**Reliability** Of a fully integrated company

**Innovation** With the support of Vallourec



# The Widest Portfolio in Stainless Steel

	SOLUTIONS	<b>BUSINESS UNIT</b>
	Stainless Steel and High Nickel alloys bars and billets	
		TTI TUBÂCEX GROUP
	Seamless Pipe and Tubes to 8" (extrusion, piercing,	SCHOELLER BLECKMANN TUBÂCEX GROUP SALEM TUBÊ TUBÂCEX GROUP
	cold finishing)	
	Seamless Pipe and Tubes to 72"	
1 8	Fittings and special	TTA TUBÂCEX GROUP
	connections from ½" to 72"	
	Stock, Service and	
	Trading Value added operations	TUBACEX UPSTREAM TECHNOLOGIES TUBÂCEX GROUP

TUBACEX TUBOS INOXIDABLES - TTI leads the production of OCTG in the facilities located in the north of Spain, whilst SCHOELLER - BLECKMANN EDELSTAHLROHR develops the production of umbilicals in the facilities located close to Vienna - Austria.

Along with IBF, Salem Tube, Tubacex India and TTA, a wide range of products related to Oil & Gas applications is offered by The Tubacex Group.

These plants are supplied by the Group's steel plant ACERÁLAVA, located in Spain, which offers a tailor made list of steels and nickel alloys and is able to offer exceptions over the standard. Tubacex's metallurgical engineers are devoted to the development of sophisticated alloys capable of operating in the demanding environments of the future.

Tubacex brings the experience of a world leader in the manufacturing of stainless steel tubes and pipes; However a strong R&D effort is needed to fulfill future needs. In collaboration with our customer's R&D and high reputed technical institutes, added value solutions have been incorporated to this challenging market.

# Tubacex Group tubes for Onshore & Offshore

# Subsea Umbilicals Risers Flowlines

TUBACEX is present in the market of base tubular products for:

- Flowlines
- Jumpers
- Risers
- Manifolds
- Loops
- Subsea umbilicals

Subsea umbilicals are control lines used in offshore wells where Christmas trees (an assembly of control valves, gauges and chokes that control oil and gas flow in a completed well) are installed on the ocean floor. Umbilicals make up part of Tubacex SURF package of tubular products for off-shore, which offer high resistance to sea water environments and to the fluids transmitted through the tubes. A key point in our strategy was to take the decision of making a huge investment in a state of the art new mill, fully dedicated to the production of umbilical tubing. This new production unit integrates the best available technologies and know-how for the production of the best quality product. Highly automatic facilities and a fully integrated traceability system contributes to a very costly efficient product.

Straight and coiled superduplex umbilical tubes - 3/8 to 4 inch I.D. Duplex and Superduplex Stainless Steel up 72"

# Platforms

Tubacex portfolio in Top Side – Platforms in the hardest environment (i.e. Artic Ocean) offers excelent mechanical properties and easy weldability:

- Piping Systems highly resistant to sea water corrosion
- Instrumentation and hydraulic tubing
- Process pipe
- Separators
- Excelent mechanical properties, Easy weldability.

Duplex and Superduplex Seamless Stainless Steel up to 72"

# **Petrochemical & Gas**

Tubacex offers an extensive grade and size portfolio to achieve designers' expectations regarding several areas & equipments in the petrochem industry:

- Regas Facilities
- Reactors
- Refineries
- Heat exchangers
- Heaters and reheaters
- Furnaces

Heat Resistant Austenitic Stainless steel and High Nickel Alloys up to 72"









# Oil Country Tubular Goods

Downhole casing and production tubing in CRA such as duplex stainless steels and nickel alloys are ideal to cope with the aggressive corrosion found in sour wells due to hydrogen sulphide, carbon dioxide and other chemicals. Predominantly, Tubacex's downhole casing and production tubing is supplied in cold-worked condition to ensure high strength despite its low weight.

Tubacex tubes cover a wide range of applications:

- HP/HT
- Sour or wet gas
- Enhanced Oil Recovery
- Chlorides, Hydrogen sulphide, free sulphur ...
- Sandscreens
- High corrosion resistance
- Chemical injection

Dual-phase grades, superaustenitic and Ni-base grades guarantee an optimum performance for each well's particular conditions and allows engineers and designers to have a perfect choice depending on the most severe conditions.

Duplex, Superduplex and high Nickel corrosion resistant alloys from 2 3/8 "to 9 5/8" O.D. Downhole equipment up to 72"



# **LNG Ships**

Seamless Stainless Steel tubes supplied by Tubacex also offer clear aplications in LNG Ships:

- GTL/LNG AND CRYOGENIC
- High pressure for gas compression units
- Process pipe
- Lines
- Cryogenic lines

Austenitic Stainless Steel 3 - 250 mm O.D.



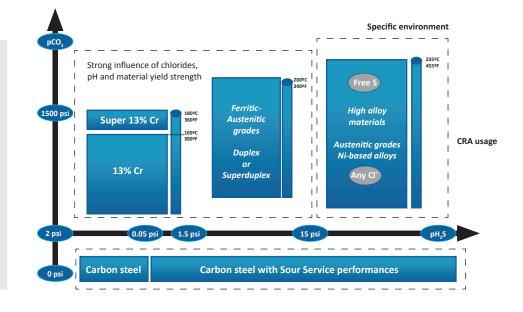
# **Oil Country Tubular Goods**

TUBACEX TUBOS INOXIDABLES - TTI (Subsidiary of TUBACEX, S.A.) has been designated to develop and lead the production of this high quality product in the facilities located in the north of Spain. A key point in our OCTG strategy is the agreement with international technological players in this industry to consolidate our world presence and satisfy the growing Customer expectations.

Downhole casing and production tubing in CRA such as duplex stainless steels and nickel alloys are ideal to cope with the aggressive corrosion found in sour wells (due to hydrogen sulphide, carbon dioxide and other chemicals). Predominantly, Tubacex's downhole casing and production tubing is supplied in cold-worked condition to ensure high strength despite its low weight.

CRA tubings are used in designs with long life, high yield strenght requirements and in wells with the most severe corrosive environments • High temperature

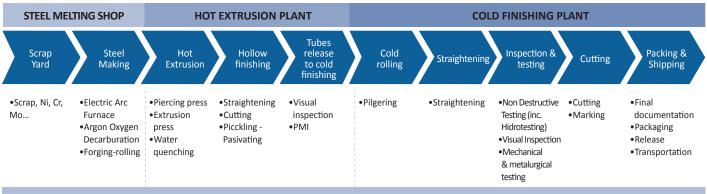
- High pressure of CO2 and/or H2S
- High chlorides content, low pH, presence of free Sulphur...



### Grades and equivalences

Material		UNS Number												ISO13680/API5CRA		CHEMISTRY							GRADE
	UNS NUMber	Group	Category	Ni	Cr	Мо	Cu	N	Others	Structure	YS (ksi)												
TX-22	S31803		22-5-3	4,5/6,5	21,0/23,0	2,5/3,5		0,14/0,20		Duplex	65/110/125												
TX-25NP	S32750	2	25-7-4	6,0/8,0	24,0/26,0	3,0/5,0	-	0,24/0,32		C	80/125/140												
TX-25W	S32760	-	25-7-4	6,0/8,0	24,0/26,0	3,0/4,0	0,50/1,0	0,20/0,30	W: 0,5/1,0	Superduplex													
TX-28N	N08535	3	25-32-3	29,0/36,5	24,0/27,0	2,5/4,0	-/1,5			Austenitic Fe	110												
TX-28	N08028	3	27-31-4	30,0/32,0	26,0/28,0	3,0/4,0	0,80/1,40	0,04/0,15		Austenitic Fe	110/125												
TX-28HY	N08028	3	27-31-4	30,0/32,0	26,0/28,0	3,0/4,0	0,80/1,40	0,04/0,15		Austenitic Fe	140												
TX-825	N08825	4	21-42-3	38,0/46,0	19,5/23,5	2,5/3,5	1,5/3,0		Ti: 0,6/1,2		110												
TX-G3	N06985	4	22-50-7	44,0/52,0	21,0/23,5	6,5/8,0	1,5/2,5		Fe: 18,0/21,0	Austenitic Ni	110/125												
TX-G50	N06950	4	20-54-9	50 min	19/21	8/10	max 0.5		Fe 15/20	Austenitic Ni	110/125												
Size range goes from 2 3/8" to 9 5/8" Lengths R2 or R3 depending on wall thickness																							

#### Process



SAFETY MANAGEMENT SYSTEM OHSAS 18001 QUALITY ASSURANCE ISO 9001 & 14001

## The group manufactures OCTG in the following dimensional range

• In 2013, a new finishing line exclusively devoted to OCTG production entered into operation in Tubacex Tubos Inoxidables. This state of the art line, along with the rest of Tubacex Group's manufacturing capabilities, covers the following range:

	OCTG: TUBACEX MANUFACTURING RANGE											
STEEL	GRADE	2 3/8"-2 7/8"	3 1/2"-4 1/2"	5"-5 1/2"	6 5/8"-7"	7 5/8"-7 3/4"	8 5/8"-9 5/8"					
	65	R3	R3	R3	R3	R2/R3	R3					
22Cr	110	R3	R3	R3	R3	R2						
	125	R3	R3	R3	R3	R2/R3	R3					
25Cr	80	R3	R3	R3	R3	R3	R3					
2501	125	R3	R3	R3	R3	R2/R3	R3					
	110	R3	R3	R3	R3	R2/R3	R3					
28Cr	125	R3	R3	R3	R3	R2/R3	R3					
	140	R3	R3	R3								
825	110	R3	R3	R3	R3	R2/R3	R3					
G3	110	R3	R3	R3	R3	R2/R3	R3					
63	125	R3	R3	R3	R2/R3	R2/R3						
CE0	110	R3	R3	R3	R3	R3	R3					
G50	125	R3	R3	R3	R2/R3	R2/R3	R3					

\*R2/R3 depending on wall thickness.

### R&D&I

Our products, processes and quality systems are qualified by the most strict Oil&Gas Operators and approved as per ISO 13680, API Q1, API 5CRA...

Thanks to our own in-house laboratories and research centers located in Spain, Austria, Italy, USA and to the collaboration with our Customers, EPCs, End-users and other research centers, Tubacex is able to provide:

- Tailor made solutions for special applications.
- Finite Element Analysis.
- Active presence at the main technological forums.
- Technical advice for material selection.
- Well environment laboratory testing.
- Failure analysis capabilities.
- Integrated manufacturing.
- Production localization.

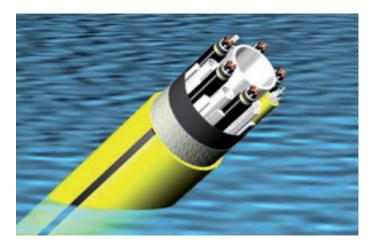


# **Subsea Umbilicals**

### **Materials Selection**

Subsea umbilicals are control lines used in offshore wells where Christmas trees (an assembly of control valves, gauges and chokes that control oil and gas flow in a completed well) are installed on the ocean floor. Umbilicals make up part of Tubacex SURF (Subsea Umbilicals, Risers jumpers, manifolds, loops and Flowlines) package of tubular products for offshore resistant to sea water environments and fluids transmitted through the tubes and with high corrosion ressitance to sea water.

For the past years almost any Subsea oil production system in the world utilized Super duplex steel within their umbilical tubes, due to high corrosion resistance in sea water, excellent mechanical properties and resistance and durability. Two superduplex grades are available.



UNS	C Max	Si Max	Mn Max	P Max	S Max	Cr	Ni	Мо	Cu Max	N	W
\$32750	0.030	0.75	1.00	0.035	0.003	24.0-26.0	6.0-8.0	3.5-5.0	0.5	0.24-0.31	-

Note: The above chemical composition is based on ASTM standards. Special requirements for chemical composition can be met, subject to agreement.

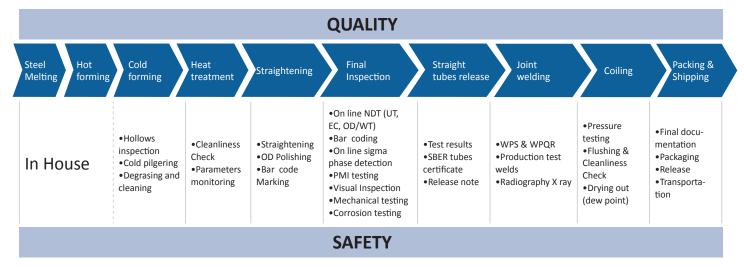
This material offer excellent anti-corrosion properties. Pitting Resistance Equivalent according to customer requirements and calculated as per: PREN = %Cr + (3.3 x % Mo) + (16 x %N).

PREW = %Cr + 3.3 x (% Mo + 0.5 x %W) + (16 x %N)

SUBSEA UMBILICALS: TUBACEX MANUFACTURING RANGE								
SUPERDUPLEX STAINLESS STEEL - ID FROM 3/8 TO 4 INCH								
Production Unit	Tubacex, Spain	SBER, Austria						
Steel grade	UNS \$32750	UNS \$32750						
Tubes finish	Straight	Straight or Coiled						

Special demands upon request

#### Process



# **Subsea Umbilicals**

### Traceability

Traceability is important to us. Each product that leaves our tube factory in Ternitz is provided with a works certificate (company certificate), which is presented to the customer upon delivery. This ensures that the quality-controlled production at SBER is traceable for each customer.

### Quality

SCHOELLER-BLECKMANN EDELSTAHLROHR manufacturing processes are designed to ensure maximum quality within the production of its seamless grades of umbilical tubes, with particular focus in the heat treatment process. Non Destructive Testing is used along the total length of all produced tubes. The company holds several approvals as a manufacturer of seamless tube and pipe, and can deliver tubular products in accordance with most international standards. Below are some examples.





### Quality management

- ASME / NCA-3800
- ISO 9001:2008

#### Approvals (some examples)

- NORSOK M-650
- ISO 17025 for laboratories
- PED 97/23/EC
- Approved manufacturer status from TüV Lloyd's register, DNV, Germanischer Lloyd, BV, etc.
- IBR well-known steel maker
- AD2000, werkblatt WO

# Product Standards (some examples)

- ISO/DIS 13628-5
- ASTM A789
- ASTM A1016
- ANST SNT-TC-1A
- NAS 1638
- ASME BPVC Section V and Section IX
- ASME B31.3
- SAE AS 4059

# **Overall Range**

The Tubacex Group has an extensive manufacturing programme for seamless stainless tubular products covering most dimensions and grades required by the Oil&Gas Industry.

The Tubacex Group has an extensive manufacturing program covering most dimensions requested by the industry:

- Our steel melting shop Aceralava produces bars and billets up to 20".
- Mills located in Europe, USA and Asia enable us to produce tubes and pipes from 3mmOD to 72".
- Austenitic tubes and pipes are produced in accordance with ASTM Standard, ASME Code and Euronorm Standards, fulfilling the main specifications.
- Tubes can be supplied in random lengths, multiple lengths, fixed lengths as well as U-tubes.
- Coiling available for umbilical application.

- Tubacex also produces Fittings from  $\rlap{kmu}{\prime}{\prime}{\prime}{\prime}{\prime}$  (5S) to 72" (no WT limitation).

As lengths or dimensions differ according to grade, size and finish, detailed information can be provided upon request.

Specific needs will also be studied at the customer's request.

	A 312 .36.10M	Manufacturing range									
0	D	WT									
Inch	mm	0,5	1,65	2,5	7,11	25,4	50,0	no limit			
0,125	3,2										
0,748	19,05										
0,984	25										
1"1/2	48,3				160						
3″	88,9			5	160						
8″	219,1	1			10	160					
20″	508	1			20		160				
42″	1067										
72″	1829										

\*Simplified reference table. Ask for details









OIL&GAS APPLICATIONS - TUBACEX GROUP

Tubacex's manufacturing range covers the main stainless steel grades requested by the oil & gas industry. Exceptions over the standard steel grades are satisfied through our Steel Melting Shop Aceralava.



From our steel plant Aceralava (spain) we offer a tailor made list of steels. Our metalurgical engineers are devoted to the developement of sophisticated steels capable of operating in the demanding environments of the future.

### **Stainless Steel Grades**

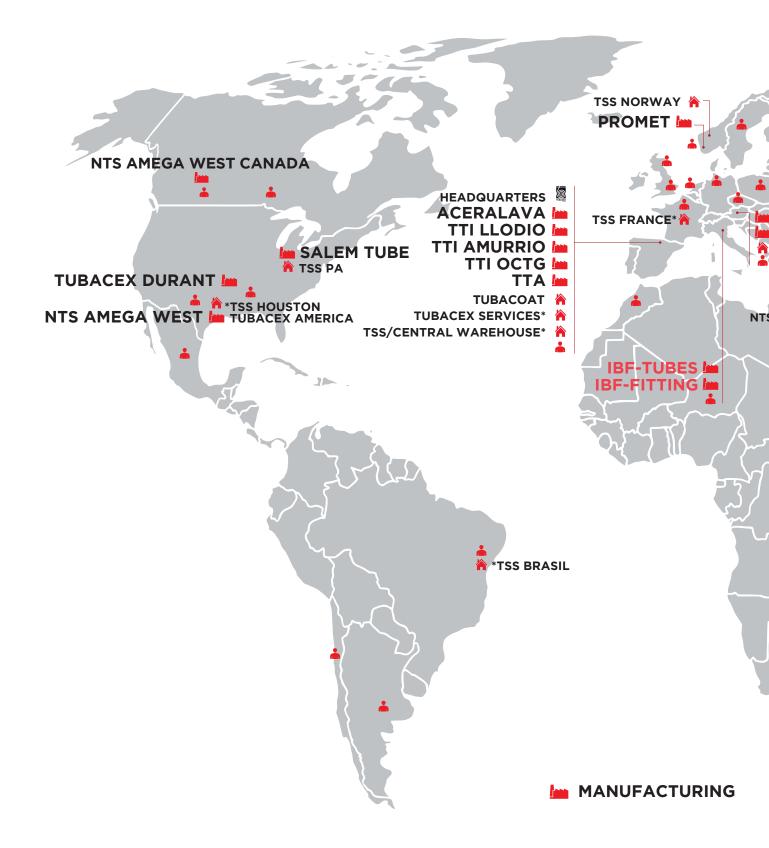
	ASTM	WNr	AFNOR	C max*	Cr	Ni	Мо	Other
	304	1.4301	TU Z 6 CN 18-09	0,08	17/20	8/11		
	304 L	1.4306	TU Z 2 CN 18-10	0,03	18/20	10/12		
	304 H		TU Z 6 CN 19-10	0,04/0,10	18/20	8/11		
	321	1.4541	TU Z 6 CNT 18-10	0,08	17/19	9/12		5 C <b>&lt;</b> Ti <b>&lt;</b> 0,60
	321 H		TU Z 6 CNT 18-12 B	0,04/0,10	17/20	9/13		4 C <b>&lt;</b> Ti <b>&lt;</b> 0,60
	347	1.4550	TU Z 6 CNNb 18-10	0,08	17/19	9/12		10 C <b>&lt;</b> Nb <b>&lt;</b> 1,0
	347 H		TU Z 6 CNNb 18-12 B	0,04/0,08	17/20	9/13		8 C ≤ Nb ≤ 1,0
	316	1.4401	TU Z 6 CND 17-11	0,08	16/18	11/14	2/3	
	316 L	1.4404	TU Z 2 CND 17-12	0,03	16/18	11/14	2/3	
ustenitic	316 Ti	1.4571	TU Z 6 CNDT 17-12	0,08	16,5/18,5	10,5/13,5	2/2,5	5 C € Ti € 0,80
D.	(316 L)	1.4435	TU Z 2 CND 17-13	0,03	17/18,5	12,5/15	2,5/3	
te	(316)	1.4436	TU Z 6 CND 17-12	0,07	16,5/18,5	11/14	2,5/3	
	316 Nb	1.4580		0,08	16/18	11/13	2/2,5	10 C < Nb < 1,0
4	316 N/316 LN			0,03	16/18	11/14	2/3	N 0,10/0,16
	316 L urea			0,03	17/18	13/15	2/3	
	317		TU Z 2 CND 19-15	0,08	18/20	11/15	3/4	
	317 L	1.4438	TU Z 2 CND 19-15	0,03	18/20	11/15	3/4	
	309 S/309 H	1.4833	TU Z 12 CN 24-12	0,08	22/24	12/15	€0,75	
	310 S/310 H	1.4845	TU Z 12 CN 25-20	0,08	24/26	19/22	€0,75	
	310 MoLN	1.4466		0,02	24/26	21/23	2/2,5	N=0,1/0,15 Si<0,4 P<0,02
		1.4828	TU Z 17 CNS 20-12	0,20	19/21	11/13		Si 1,5/2,5
	314	1.4841	TU Z 15 CNS 25-20	0,15	24/26	19/21		Si 1,5/2,5
	UNS S31254	1.4547		0,02	19,5/20,5	17,5/18,5	6,0/6,5	Cu 0,50/1,00 N 0,18/0,22
ti c	UNS \$31803	1.4462	TU Z 2 CND 22-05-03	0,03	21/23	4,5/6,5	2,5/3,5	N 0,12/0,20
Ferritic austenitic	UNS \$32750				24,0/26,0	6,0/8,0	3,0/5,0	
5 -	UNS \$32760	1.4501	TU Z 3 CND 25-06-Az	0,03	<b>2</b> 4/26	6/8	3/5	N 0,2/0,3 Cu & W 0,5/1,0
	904 L	1.4539	TU Z 1 CNDU 25-20	0,02	19/21	24/26	4/5	Cu 1,20/2,00 N 0,04/0,10
	800-H-HT	1.4876	(TU Z10 NC 32-21)	0,6/0,10	19/23	30/35		Al & Ti 0,15/0,60
High Nickel	UNS N08020	2.4660		0,07	19/21	32/38	2/3	Cu 3/4 Nb 8xC-1,0 Fe Balance
ΞZ	UNS N08825	2.4858		0,05	19,5/23,5	38/46	2,5/3,5	Cu 1,5/3,0 Al 0,2 max Ti 0,6/1,2 Fe Balance
	UNS N08028	1.4563	TU Z2 CNDU 31-27	0,03	26/28	30/32	3/4	Cu=0,8/1,4 N=0,04/0,15 Fe Balance
	G-3 N06985				21,0/23,5	44,0/52,0	6,5/8,0	Fe: 18,0/21,0

\* Maximum unless otherwise indicated

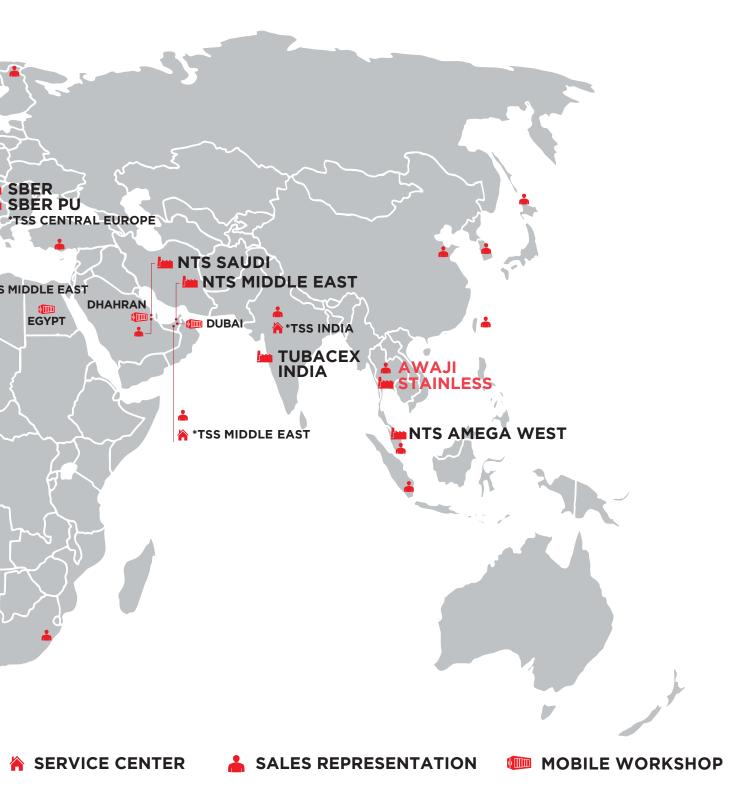
Improved Machinability Available MECATEX

In addition to these standards, Tubacex's capabilities include a wide range of stainless steel and high nickel alloy grades to complement all the needs of our customers.









# **Quality and Approvals**

Tubacex Group holds several approvals as a manufacturer of seamless tube and pipe, and can deliver tubular products in accordance with most international standards.

### Management system certificates

ISO 9001 API Q1 API 5 CRA

### Approvals and other certifications\*

Approved manufacturer according to TÜV, Lloyd's register, DNV, Germanischer Lloyd's, BV, Norsok etc. PED 97/23/EC AD2000, werkblatt W0 JIS Mark scheme ASME Quality system as material organization for ferrous and non ferrous material

 $\ast$  Not valid for all production units. Please contact your local sales office for detailed information.

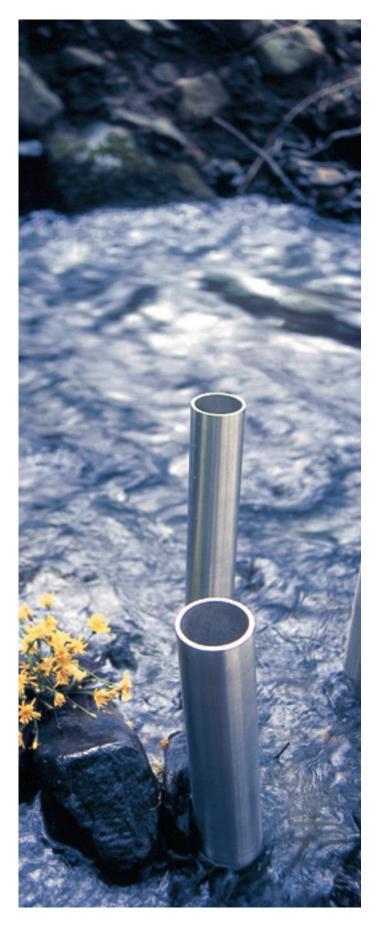
## Safety and environmental responsibility

Tubacex Group is highly engaged with the environment and it is ISO 14001 certified. Additionally Occupational health and Safety is also a key element of our culture. The company is OHSAS 18.001 certified.





Currently the Tubacex Group is exporting into more than 100 countries worldwide from its manufacturing sites and warehouses. The company has 15 commercial offices and a wide network of agents in several countries that lead to a global presence.



#### MANUFACTURING COMPANIES

Acería de Álava, S.A. STEEL MELTING SHOP Amurrio. SPAIN

Tubacex Tubos Inoxidables, S.A. HOT EXTRUSION PLANT Llodio. SPAIN COLD FINISHING PLANT

OCTG FINISHING PLANT Amurrio. SPAIN

#### Schoeller Bleckmann Edelstahlrohr, GmbH COLD FINISHING PLANT

HOT EXTRUSION PLANT SPECIAL TUBE PLANT Ternitz. AUSTRIA

Salem Tube, Inc. COLD FINISHING PLANT Greenville. PA. USA

IBF, S.p.a. TUBES DIVISION Vituone - Milano. ITALY FITINGS DIVISION San Nicolò - Piacenza. ITALY

# SERVICE & DISTRIBUTION COMPANIES

Tubacex Service Solutions, S.A. STAINLESS STEEL LONG PRODUCTS DISTRIBUTION Amurrio. SPAIN

Tubacex America, Inc. / TSS Houston STAINLESS STEEL LONG PRODUCTS DISTRIBUTION Houston. UNITED STATES

#### Metaux Inox Services, S.A.S. / TSS France STAINLESS STEEL LONG PRODUCTS DISTRIBUTION

Satolas & Bonce. FRANCE

#### TSS Central Europe

STAINLESS STEEL LONG PRODUCTS DISTRIBUTION Ternitz. AUSTRIA Tubacex Prakash COLD FINISHING PLANT Umbergaon. INDIA

#### Tubacex Awaji

STAINLESS FITTINGS Amphur Muang-Samutprakarn. THAILAND

Tubacex Taylor Accesorios, S.A. BUTT WELDING FITTINGS Artzeniega. SPAIN

#### Tubacex Services, S.L.

TUBE FINISHING SERVICES Santander. SPAIN

#### Tubacoat

CERAMIC TUBE COATING Santander. SPAIN

#### NTS Group

MACHINED PARTS MANUFACTURING & REPAIR UAE USA CANADA SINGAPORE NORWAY SAUDI ARABIA

#### TSS Brasil STAINLESS STEEL LONG PRODUCTS DISTRIBUTION Sao Paolo. BRAZIL

TSS India STAINLESS STEEL LONG PRODUCTS DISTRIBUTION Gandhidham. INDIA

#### **TSS Middle East**

STAINLESS STEEL LONG PRODUCTS DISTRIBUTION Dubai. UAE

Tubacex Upstream Technologies OCTG Premium solutions Leioa. SPAIN

#### TSS Norway

STAINLESS STEEL PRODUCTS DISTRIBUTION & SERVICE BLOMSTERDALEN. NORWAY



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