



CENTRAVIS tubes for the most demanding applications

While CENTRAVIS PRODUCTION UKRAINE has a well established reputation for producing high quality seamless stainless steel tubes, investments in a state-of-the-art extrusion press have elevated the company's production standards even higher. The company now excels in producing extra-long seamless stainless steel tubes for the demanding international furnace market. The installation of Europe's largest hot extrusion press, expertise in producing high end alloys, and a wealth of approvals from key end users is seeing the company's market share rise. Stainless Steel World spoke to Igor Marfut, Sales Director and Andriy Fed`ko, Global Product Leader (Tubes & Pipes for Refining and Petrochemical Industry) to learn more about the company's growth in this area and the expertise it is now offering the global furnace tubing market.

By Joanne McIntyre

CENTRAVIS produces a wide range of seamless stainless steel tubing for a wealth of demanding applications. However recently there have been significant advances in its furnace tubing activities. From the company headquarters in Ukraine, Andriy and Igor explained that furnace tubes

are the most critical part of furnaces designed for fired heating, evaporation and cracking, as well as other hyper thermal chemical processes in refinery and petrochemical industries. The selection of the materials is driven by the need for the materials to withstand high temperatures (650°C and above)

and corrosive media (chloride and sulfide) conditions and safety flow. High creep strength requirements and resistance to stress corrosion cracking define a set of specific requirements to the microstructure of the steel and, therefore, proper and sustainable heat treatment modes.



Igor Marfut: "Today CENTRAVIS is supplying products to this market that very few other suppliers can."



Andriy Fed'ko: "CENTRAVIS as a global supplier has several advantages: extra length, all grades used for furnaces application incl. ni-alloys, approvals from major oil & gas companies, 8 weeks delivery for critical projects."

hot extrusion presses, and the main capacity for hot extrusion remains with European producers."

CENTRAVIS has met the challenge by investing in a state-of-the-art extrusion press which has elevated the company's production standards. "We have installed the most advanced extrusion press in Europe with an extrusion force of up to 4,400 tons" explains Igor. "The decision to invest in this new press was taken in direct response to growing demand from the market for longer tubes applications. Having gained certifications to compete in this market by key players including Shell, Exxon, Bourouge, BP, Phillips 66, BASF, ADNOC (ADMA-OPCO), Repsol, etc. we are now able to supply to petrochemical and refinery projects all over the world."

Seamless furnace tubes

There are two ways to lengthen a heater, explains Igor. One way is to weld shorter pieces of tubes together; the other is to extrude the required long

tubes as a one-piece construction.

A combination of the two methods is used as necessary.

"The disadvantages of the first method are obvious," explains Igor. "Many customers now require long length tubes without welding, however only few producers are capable to produce these long lengths, which is a significant advantage for CENTRAVIS. If the customer has the choice of purchasing one length, instead of two, which must be welded, the choice is simple not only for efficiency and cost reasons but also because a weld will always be a concern as well as being a source of stress concentration. The microstructure of the heat-affected zone adjacent to the weld is dramatically different from that of the tube. Also, during welding, it is impossible to ensure perfect concentricity of the tubes being welded together, which may lead to non-uniform stress and temperature distributions within the tube material. All these factors combined may significantly decrease the service life of the unit. To make matters worse, welding requires additional operations that increase the

"Furnace tubes are commonly produced by hot extrusion processes that must ensure compliance to stringent dimensional tolerances, as well as provide the required set of mechanical and corrosion resistance properties," begins Igor. "The longer the tube the more challenging this becomes."

Today many leading engineering companies have started to use extra-long heater/furnace tubes for the benefit of larger-capacity units with a decreased number of welds. This is true for both box and coil designs. This represents a new challenge for tube manufacturers and puts a lot of strain on their production processes. New facilities have to be designed with these new requirements in mind, while the existing facilities may also have to be modified to meet the new demand.

"Today CENTRAVIS is supplying products to this market that very few other suppliers can," adds Igor. "Only a small number of manufacturers have

Project highlight: Laffan refinery

Laffan Refinery, Qatar's first condensate refinery, started production in September 2009 and is one of the largest condensate refineries in the world. It has a production capacity of 61,000 bpsd of naphtha, 52,000 bpsd of kerojet, 24,000 bpsd of gasoil, and 9,000 bpsd of LPG. The shareholders of the Laffan Refinery are Qatar Petroleum (51%), ExxonMobil (10%), Total (10%), Idemitsu (10%), Cosmo (10%), Mitsui (4.5%) and Marubeni (4.5%)

Location: Ras Laffan Industrial City, Qatar

End user: Qatargas

EPC: Chiyoda Engineering Japan & CTCI Taiwan

OEM: FEI Japan

Customer: Buhlmann Singapore

CENTRAVIS supplied about 252t of furnace tubes in grades 316H, 347H.

cost of the furnace, such as beveling, preparation of the surfaces, use of the filler metal, the process of welding itself, PWHT, X-Ray and/or other NDE methods. Even in situations where welding is inevitable, one must work towards decreasing the number of joints.”

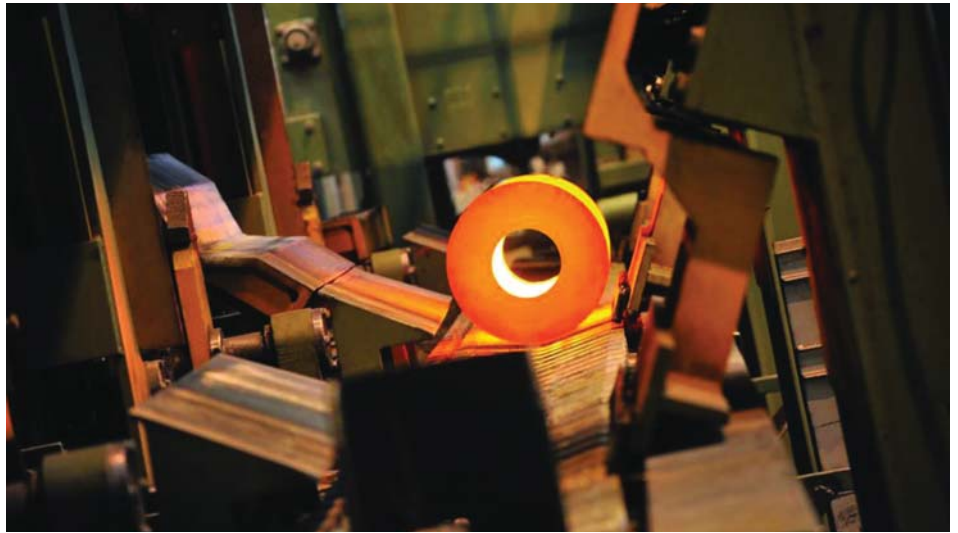
The most popular heater sizes are NPS 3” to NPS 8” (and in some cases 10”) in various schedules, with average or minimum walls. Such tubes are always ordered in cut lengths to fit the specific design of the unit.

“It is always the engineer’s first preference to use tubes manufactured as one continuous length, and only when suppliers are unable to offer the required lengths will engineers resort to welding tubes together to reach the design length. Today designs that require single length long tubes are becoming increasingly popular, which prompted our investment in meeting that demand.”

Demanding materials

Andriy explains that the most prevalent grades in heater design are TP 347/H and TP 321/H, followed by TP 304H and TP 316H. As grades 347/H and 321/H are chemically stabilized by titanium, the tubes made of these grades require an additional stabilization heat treatment for 4 hours at 899°C (1,652°F). Due to the complexity of the process, this prerequisite represents another challenge and significantly limits the number of suppliers that can comply with the full set of requirements.

Andriy: “CENTRAVIS has mastered the challenge of producing nickel alloys



CENTRAVIS has developed advanced heat treatment technology in the extrusion press line.

Project highlight: Baytown complex

The ExxonMobil Baytown area is the largest petroleum and petrochemical complex in the United States and the largest global manufacturer of base stocks and synthetic lubes. It has the capacity to process up to 584,000 barrels of crude oil per day. More than 7.2 billion pounds of petrochemical products are manufactured each year.

Location: Baytown (Texas, USA)

End user: ExxonMobil

CENTRAVIS supplied about 660 ton of furnace tubes in grades 304H, 316H for fired heaters. OD: 88,9 - 219,08mm. WT: 7,11 – 12,7mm

for furnace applications. These grades contain over 32% to 45% nickel and are challenging to produce, especially grade 825. As a global supplier we now offer several advantages: our powerful extrusion press and technology of production extra tubes&pipes length, approvals from major global companies and our mastery of all

grades used for furnace applications, including nickel alloys.”

“For furnace pipes and tubes, we are able to offer production and delivery within 8 weeks for critical projects, compared to the industry standard of 3 to 4 months. This is a significant advantage.”

Complex longer tubes

In very simple terms, when producing tubes the more material put into the container prior to hot extrusion, the longer the length of the tubes for a given diameter and wall thickness. Other important variables to consider are the extrusion coefficient, the maximum deformation values, as well as the extrusion temperature.

Andriy continues: “At room temperature, the maximum deformation most materials could withstand is relatively low. This is true even for austenitic stainless steels, which are known for their high ductility.”

As a result, manufacturers have to look for ways to increase formability of materials, and that is where the process of hot extrusion comes in handy: the advantage of hot deformation is that at elevated temperatures, formability of steels increases dramatically. If the



Furnace tubes must comply to stringent dimensional tolerances.

starting material (round bar, also known as tube billet) is heated to temperatures just exceeding those required for annealing during hot extrusion, it can undergo deformations of up to 74-98%. "There are other technical problems associated with the extrusion of long pipes, continues Andriy. "It's important to heat the billet uniformly – throughout its thickness and along the entire length. For thicker loads in the furnace, this means careful selection of holding times and power inputs. Transition time from the furnace to the press must be minimized in order to prevent the billet cooling below the temperature required for extrusion. The extrusion force should allow the optimum flow rate of the metal between the mandrel of the press and its outlet. If the flow is too fast the associated turbulence may cause problems with the quality of surfaces, such as cavities and waves. Slower flows would mean that two ends of the pipe may be formed at significantly different temperatures and, therefore, the pipe may have non-uniform distribution of the mechanical properties over length. Extruding longer pipes also means that the tooling of the press remains in contact with hot metal for longer periods, and this may result in accelerated wear of the mandrel and matrix. In addition, ensuring uniform lubrication of extra-long tubes at extrusion represents another significant challenge."

"These and other related issues have been carefully studied and addressed at CENTRAVIS. Our process provides for optimum parameters at each crucial stage of production to ensure consistent quality output."

Fit for the challenge

Today CENTRAVIS has one of the most powerful hot extrusion presses in Europe. In order to meet customer demand for longer furnace tubes, a research project was launched in 2014



The company has installed the most advanced extrusion press in Europe with an extrusion force of up to 4,400 tons.

to increase press capacities to extrude longer production. During the project's utilization phase, a new length calculator was developed and deployed, while a number of other technological parameters were addressed.

The improved length of furnace tubes achieved as a result of this initiative, where many of the tubes can now be as long as 15.5 m. Theoretically, many of them could be extruded to lengths of even 22-24 m. However, other limitations, such as the straightening machine and pickling bath dimensions, make this currently impossible. Once these limitations are resolved, CENTRAVIS will be able to deliver even longer furnace tubes, covering in particular, one of the common lengths of 66 feet.

In order to guarantee the improved mechanical, technological, and corrosion properties, CENTRAVIS has also developed and implemented an advanced heat treatment technology in the press line.

Due to the individual approach of chemical composition and extrusion temperatures influencing the

microstructure formation, hot extruded tubes and pipes are characterized by the improved ability to withstand corrosion, even without additional stabilization heat treatment, as well as advanced operational properties.

Market diversity

While 2015 was a challenging year for most producers of stainless steel tubes and pipes, CENTRAVIS was able to end the year on a high thanks to its diversity into the furnace tubing market, as well as other areas. Igor concludes: "We were able to maintain our global market share partly by increasing production for sectors other than oil and gas. The automotive business in particular is a strong market for us, and it was one of the few business segments that increased globally."

CENTRAVIS is currently the second largest global supplier in the world for automotive for seamless stainless steel tubes and pipes. As with the furnace tubing sector, its expertise and investments in modern equipment have given it the edge over competitors.

Project highlight: Jamal LNG

The field development plan provides for the drilling of 208 wells at 19 well drilling pads; the production potential of the field exceeds 27 bcm of natural gas per annum. Natural gas produced at the field will be delivered to the international markets in a form of liquefied natural gas or LNG which requires the construction of a liquefaction plant consisting of three production trains of 5.5 mmt annual capacity each.

Location: South-Tambayskoye field, Yamal Peninsula, Russian Federation

End user: Yamgaz SNC (JV between Technip and JGC Corp.)

EPC: General Electric

Customer: Boustead Heaters

CENTRAVIS supplied about 321t of 800H of tubes for furnaces application. OD: 88.9mm; WT: 5,49 – 7,62mm

Facts & Figures

Name: CENTRAVIS PRODUCTION UKRAINE

Headquarters: Nikopol (Dnepropetrovsk region) Ukraine

Products: General tubes & pipes, instrumentation tubes, boiler tubes, furnace tubes, hollow bars, heat exchanger tubes

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