

# Technical Bulletin

provided by



Copyright by Henkel 2005. All rights reserved.  
Data shown is typical, and should not be construed  
as limiting or necessarily suitable for design. Actual  
data may vary from those shown herein.

## INSTALLATION OF A STAINLESS STEEL TUBE SYSTEM FOR PHARMACEUTICAL APPLICATIONS

Technical and costing aspects of the planning

Essay No 2 / Rev. 00

Georg Henkel, MSE, PhD

Benedikt Henkel, MSE

*The component's  
value is assured  
by its surface*



# INSTALLATION OF A STAINLESS STEEL TUBE SYSTEM FOR PHARMACEUTICAL APPLICATIONS

## Technical and costing aspects of the planning

It is one of the basic necessities for the total cost calculation of a tube system to clarify and de-fine a number of factors. Starting point must be the technical specification with special regard to the necessary characteristics of the tube system which sufficiently fulfil the technical specification. These characteristics are in particular :

### **1. Choice of material**

This must take into account:

The alloy (e.g. 1.4435 etc.) tolerances, surface quality (e.g. electropolished material) special forms (e.g. extended tangents for elbow) packing, documentation, availability / delivery times, heat fidelity, compatibility with various tube components such as valves, flow meters etc.

### **2. Weld process**

A choice must be made between hand welding, TIG and orbital welding with an open or enclosed weld head. This decision can often not be freely made as the use of automatic machine welding through an orbital welding process is often specified. The weld process already has an influence on the choice of material e.g. tolerances.

### **3. Inspection procedure and specifications**

It is desirable and in the interest of the customer (end user) as of the supplier to specify the complete installation in detailed steps and to institute an appropriate inspection system:

- material specification
- installation specification
- weld process specification
- accompanying independent site inspection including records of material welding, mechanics etc.
- final inspection.

For the accompanying and final inspection of the tube system, the testing should be carried out according to the specification as well as the endoscopic inspection of the welds.

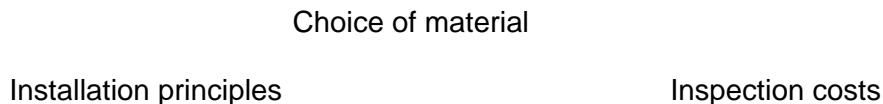
The inspection procedures must be formulated in a logical record and should lead to a complete documentation following on from the final inspection.

#### 4. Installation principles

The handling on site of high quality stainless steel tubes presumes basic principles as regards packaging, storage and handling, tool material and special care during welding. These principles must be stated without fail in an installation specification and be checked by the inspection body. Neglect of the specification could lead to considerable damage to the tubes system.

The final conditioning of the system by chemical pickling and passivation respectively only passivation together with a special specification should be written into the installation guidelines.

The factors which influence cost are of great importance for a specification which orientates itself on the end-user and interact on one another as in a magic triangle:



#### Extreme examples :

A. seemingly cheap material - partially from different sources.

- higher internal and external inspection costs
- technical problems cause delivery problems during installation, parts such as elbows, T-piece etc. have to be replaced which in turn causes higher expense through more frequent inspection
- overtime of the installing team caused by delays
- pickling becomes necessary due to discoloration of the weld

B. seemingly expensive material - often from a central source (e.g. safetron, electrochemically polished)

- minimal internal and external inspection costs due to optimal certification
- no technical problems and as a consequence fast installation, several "attempts" before the weld passes inspection are seldom
- electropolished material can ensure, with competent purging, welds which are free of discoloration so that pickling is unnecessary and only a final passivation needs to be carried out.

The following figures illustrate these extreme examples:

	"Cheap material"	"Expensive Material "
Material costs:		
Tube / Elbows / Tees / Reducer etc	425.000,--	695.000,--
extra material for repeat welds	54.000,--	3.000,--
Installation costs 75,-- EUR/h	286.000,--	186.000,--
Inspection cost	30 % 130.000,--	10 % 40.000,--
Final treatment (pickling / passivation)	110.000,--	35.000,--
	<b>1.005.000,--</b>	<b>959.000,--</b>

This representative example shows impressively that with seemingly expensive material, in the end, a tube system can be installed which costs less and, most importantly, is technically better and safer.

In conclusion it should be the objective to take the whole range of costs factors into account as a basis for specific decisions.

Please contact us for further information

# Technical Bulletin

## Procedures for the treatment of metal surfaces

- ▶ Electrochemical polishing
- ▶ Electrochemical and chemical deburring
- ▶ Chemical polishing
- ▶ Chemical pickling
- ▶ Passivation
- ▶ Derouging and professional repassivation

All services can be carried out on the premises of the customer

## Development and supply of

- ▶ chemicals for pickling, electropolishing and passivation of metal surfaces
- ▶ chemicals for derouging and repassivation of stainless steel surfaces
- ▶ turnkey constructions/equipments for the chemical and electrochemical surface treatment of metals

## Technical consultation

- ▶ for the surface treatment of
  - Stainless steel (i.e. 1.4435 / 1.4404 / 316l, 1.4539 / 904l, etc.)
  - Nickel and Nickel Alloys (i.e. Alloy 59, Hastelloy, Inconel)
  - Aluminium
  - Copper
  - Niobium
  - Titanium
  - Zirkonium
  - C-steel
- ▶ for apparatus, tubes and fittings in the food, beverage, chemical, cosmetic and pharmaceutical industries, bio and medical technology, plant, refrigeration and heat technology
- ▶ for surface treatment specifications for apparatus and tube systems
- ▶ concerning corrosion of stainless steel

## Further services

- ▶ Colouring of stainless steel
- ▶ Clean room treatment
- ▶ Waste water technology
- ▶ Research & Development

**We are member of VDMA, EHEDG und ISPE**

For further information please contact us

[info@henkel-epol.com](mailto:info@henkel-epol.com)  
[www.henkel-epol.com](http://www.henkel-epol.com)



Certified according to EN ISO 9001:2000  
Certificate no : A06/0007



HENKEL Beiz- und Elektropolieretechnik  
GmbH & Co. KG  
Stoissmühle 2  
A – 3830 Waidhofen / Thaya  
Tel : + 43 (0) 28 42 / 543 31 - 0\*  
Fax : + 43 (0) 28 42 / 543 31 - 30  
[info@henkel-epol.at](mailto:info@henkel-epol.at)  
[www.henkel-epol.com](http://www.henkel-epol.com)

HENKEL Beiz- und Elektropolieretechnik  
GmbH & Co. KG  
An der Autobahn 12  
D – 19306 Neustadt-Glewe  
Tel : + 49 (0) 387 57 / 66 - 0\*  
Fax : + 49 (0) 387 57 / 66 - 122  
[info@henkel-epol.com](mailto:info@henkel-epol.com)  
[www.henkel-epol.com](http://www.henkel-epol.com)

HENKEL Kémiai és Elektrokémiai  
Felületkezelő Kft  
H – 9172 Györzámoly, Központi Major  
Tel : + 36 (0) 96 / 352 - 035  
Fax : + 36 (0) 96 / 585 - 035  
[info@henkel-epol.hu](mailto:info@henkel-epol.hu)  
[www.henkel-epol.com](http://www.henkel-epol.com)

*The component's  
value is assured  
by its surface*

