

# SpG seminar & Safety training

Vilnius, on the 3d of November

## *Ari Paavilainen*

### **Manager Customer Engineering Finland**



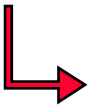
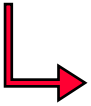
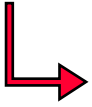
- In AGA since 2001
- Project manager, SpG/ SEMI customers  
2001 - 2007

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## CONTENT OF PRESENTATION

- Types of installations
- Customers general needs
- Customer technical needs
- Installation methods

## HOW SPECIALTY GASES DIFFER FROM INDUSTRIAL GASES

Industrial Nitrogen 2.5 <i>Standard level</i>	99.5 % 	Impurities max 5000 ppm
Instrument Nitrogen 5.0 <i>Laboratory level</i>	99.999 % 	10 ppm
Scientific Nitrogen 6.0 <i>Ultra High Purity-level</i>	99.9999 % 	1 ppm

## TYPES OF INSTALLATIONS

### “Standard”- level

- Tank installations, gas centrals
- "MI" and "HC"- installations for industry

### Laboratory- level

- HiQ - concept, REDLINE-products. Universities, industry
- Medical, analysing and high quality systems for industry

### Ultra High Purity - level

- Some laboratories, electronics, IT -tecnology.....
- **Semiconductor industry, electronics**

**“ A GAS INSTALLATION IS A TECHNICAL SYSTEM FOR SAFE AND RELIABLE TRANSPORT OF GASES TO THE CONSUMER ”**

1. From the point of gas supply (cylinder, battery, bundle, tank)
2. Through the the pipeline
3. To the point of use (device, procedure, process) under maintenance of the delivery specification



**Piping**

Length of tubing  
Flow

**Valves**

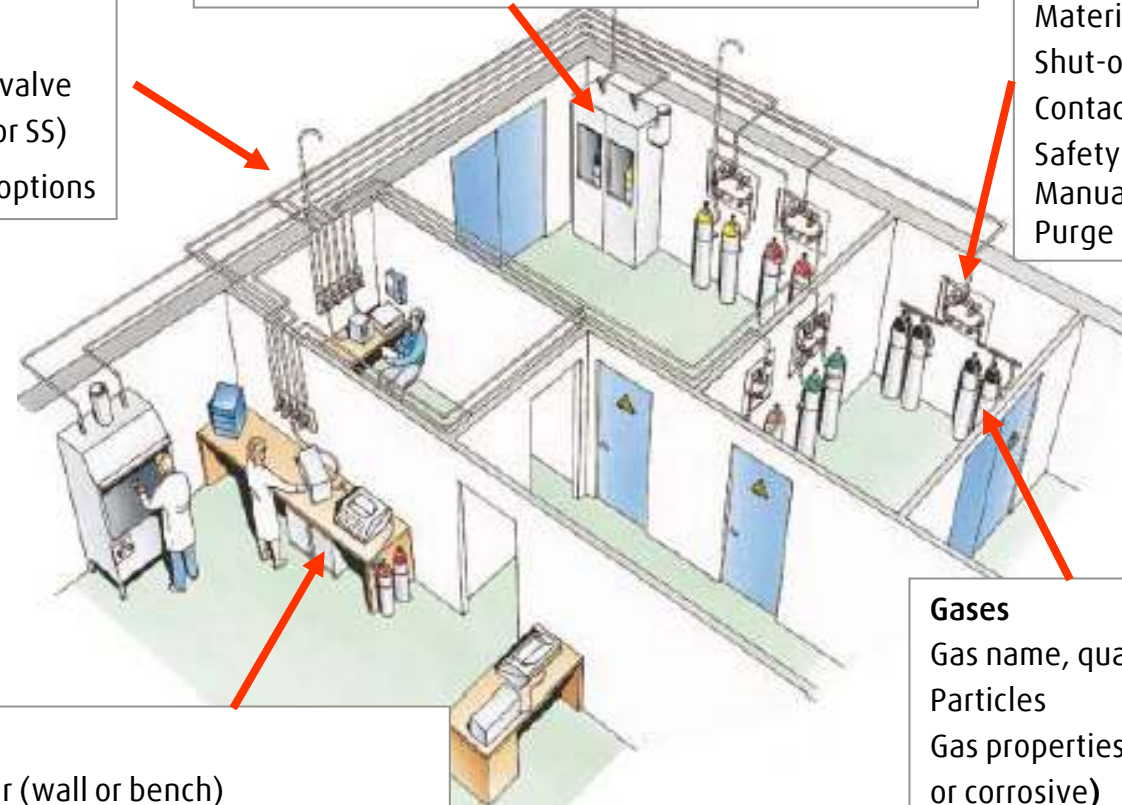
Section shut off valve  
Material (brass or SS)  
Reservation for options

**Storage**

Separate building, container or laboratory  
Note! Different kinds of gases shall be separated

**Gas panels**

Number of cylinder / bundles  
Single or double  
Material (brass or SS)  
Shut-off valve  
Contact gauges  
Safety outlet  
Manual / semiautomatic  
Purge



**Point-of-use**

Type of regulator (wall or bench)  
Material (brass or SS)  
Outlet connection (6, 8, 10 mm tube or other)  
Outlet pressure and flow

**Gases**

Gas name, quality/purity  
Particles  
Gas properties (inert, flammable, toxic or corrosive)

**Other information**

Layout drawing and digital photos if available.

## WHAT ELSE MAKES CASE TO UHP- INSTALLATION

Purity 4.8 - 8.0

?

?

?

?

## WHAT MAKES CASE TO UHP- INSTALLATION

**Purity 4.8 - 8.0**

**Toxic gas**

**Corrosive gas**

**Particle speck**

**Contamination**

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## CUSTOMERS GENERAL NEEDS

**Full service !**

## CUSTOMERS GENERAL NEEDS

- **Guaranteed availability and continuity to their process**
- **Simple operation for customer**
- Plannings
- **Realization, on schedule**
- Testing and introduction
- Dokumentation, component marking
- Guarantee (1yer or more) and service!!
- Low price

## CUSTOMERS TECHNICAL NEEDS

**Maximize safety**

(**tightness**, pressure, corrosive)

Maximize gas purity

(**tightness**, surface finishing)

Optimal dimensions

Particle filtration

Right materials, piping and components

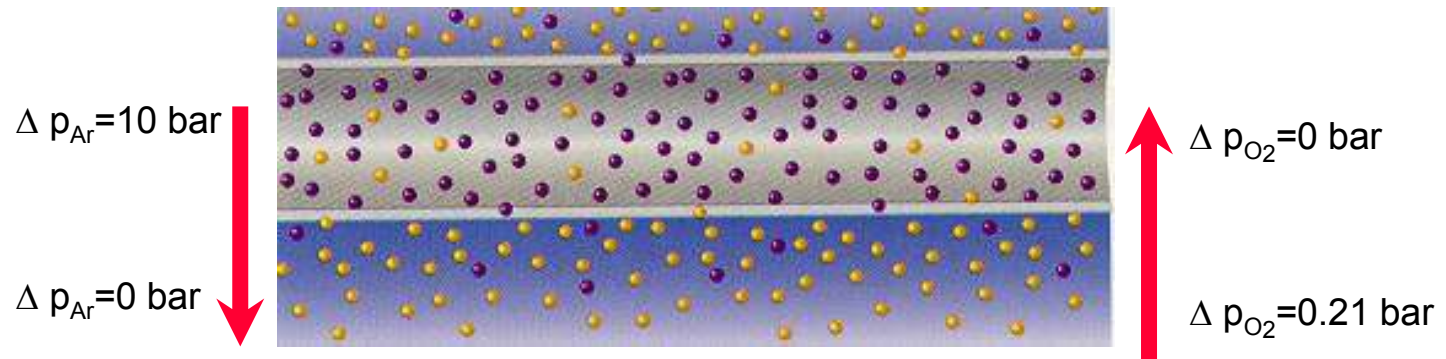
Purge possibility

Testing process

Documentation



## DIFFUSION



Contaminants may diffuse through various materials in different ways, also in counter-current diffusion.

## OXYGEN DIFFUSION IN DIFFERENT PIPE MATERIALS

Argon  
10 bar  
5 LN/h  
1 m tube  
6x1 mm tube diam

Material	ppm Oxygen
Glass	0
<b>Stainless Steel 316 L</b>	<b>0</b>
Copper	0
Leakage (20 micron)	20
Kel-F	0.6
Neoprene	7
Polyethylene	11
Teflon	13
Polyvinyl	27
Natural Rubber	40

## CUSTOMERS TECHNICAL NEEDS

Maximize safety (tightness, pressure, corrosive)

Maximize gas purity (tightness, surface finishing)

Optimal dimensions ( particles, noise, price)

**Particle filtration (customers specs, -application )**

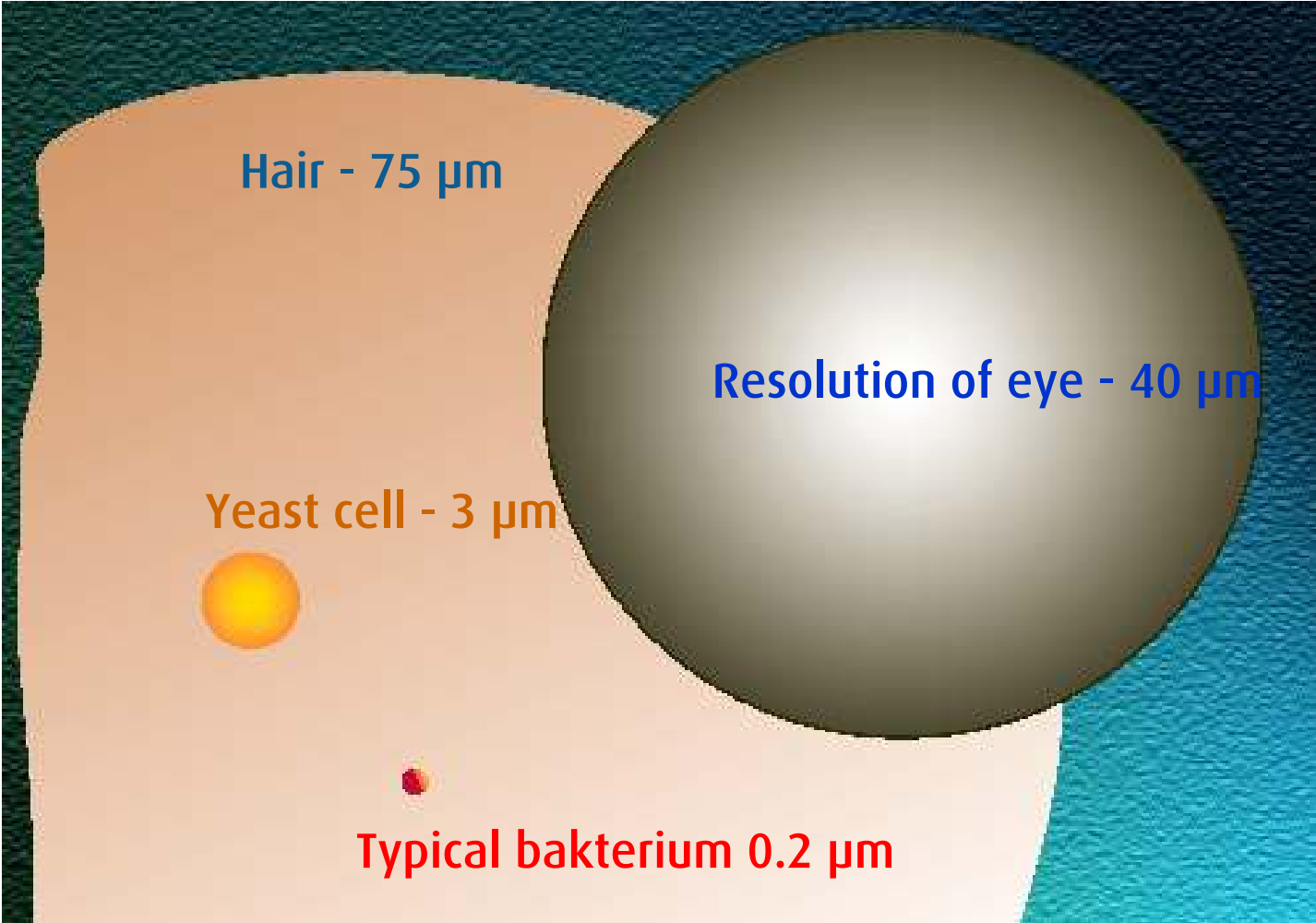
Right materials, piping and components

Purge possibility

Testing proses

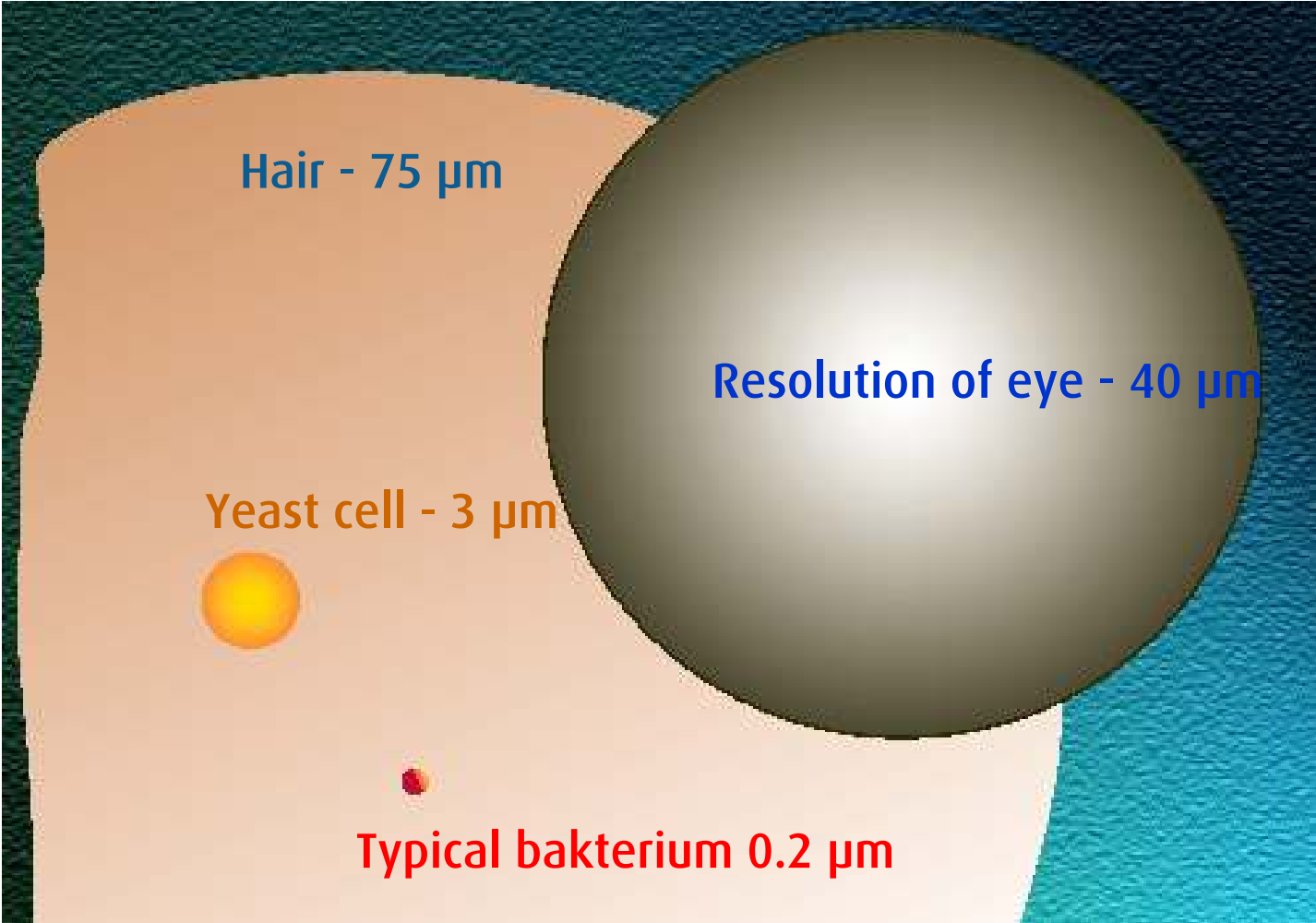
Dokumentation





Semicon, UHP - applications

??? μm !



Semicon application

**0.003 μm !**

## CUSTOMERS TECHNICAL NEEDS

**Maximize safety**

(tightness, pressure, corrosive)

Maximize gas purity

(tightness, surface finishing)

Optimal dimensions

Particle filtration

Right materials, piping and components

Purge possibility

Testing process

Documentation



## CUSTOMERS TECHNICAL NEEDS, DETAILS

Tightness / Helium leak test	$10^{-7}$ ssc/sec or better
Maximize gas purity	5.0 - 8.0 level
Optimal dimensions, flow speed	5-to 10 m/s
Filtration	0,003 $\mu\text{m}$
Always 316L , surface finish	Ra 0.2 $\mu\text{m}$ (10 $\mu\text{in}$ ) or better
Chemically cleaned, electro polished, clean room package.....	
Dokumentation	CAD 2010



**Tightness**  
**cm<sup>3</sup>/sec**

**He leak rate 1 ml**

1 x 10 <sup>-1</sup>	10 sec
1 x 10 <sup>-3</sup>	15 min
1 x 10 <sup>-5</sup> (Swagelok fitting)	30 h
1 x 10 <sup>-7</sup>	4 mon
1 x 10 <sup>-9</sup> (VCR fitting)	30 yrs

## CUSTOMERS TECHNICAL NEEDS, DETAILS

### Testing:

Leak test with pressure

min. 8 hours

Moisture analysis (H<sub>2</sub>O) at

ppm/ppb-level

Oxygen (O<sub>2</sub>) at

ppm/ ppb-level

Particle count

max 10 particle < 0,1  $\mu$ m /scft



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## GAS DISTRIBUTION SYSTEMS

### INSTALLATION TECHNIQUE

What ever you do

**Most important thing to remember is??**

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## GAS DISTRIBUTION SYSTEMS

### INSTALLATION TECHNIQUE

What ever you do

Remember the **SAFETY**

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## GAS DISTRIBUTION SYSTEMS

### INSTALLATION TECHNIQUE

- LAWS and ORDERS
- Local and European Union
- PED
- ATEX
- Semi Standard
- LIMMS



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## GAS DISTRIBUTION SYSTEMS

### INSTALLATION TECHNIQUE

- We use allways SS 316L materials
- Single packed / plugs
- Pipes must be chemiqally cleaned (CQ- ja CQE) or **electropolished** (PQE)
- We must have material certificates if customer need them

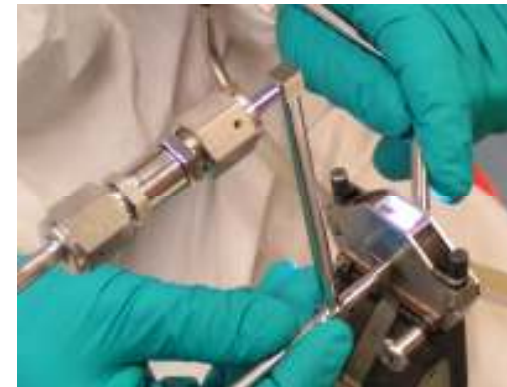


## GAS DISTRIBUTION SYSTEMS

### INSTALLATION TECHNIQUE

#### Orbital weldings

- Minimum heat transfer
- No colour difference
- No smoke black ( in-/outside), remember the particles!
- Blank, straight, almost invisible welding
- All weldings are similar !



## GAS DISTRIBUTION SYSTEMS

### INSTALLATION TECHNIQUE

- Use always plugs during installation!!!
- Use always enough hangers
- Mark ends of pipes during the work
- Mark always the ready installation (remember the safety)
- Make always testing reports (leakagetest with pressure, He-testing)
- Don't install lines inside the walls.....
  - that is especially important if we are talking about fittings!!

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## GAS DISTRIBUTION SYSTEMS

### INSTALLATION TECHNIQUE

- Building must be ready when we start the installation
- **“End cleaning” must be done before our work**
- Everything is clean when we are ready !
- Purge old lines careful (toxic and flammable)
- Purge lines from gaspanels to out (toxic and flammable)

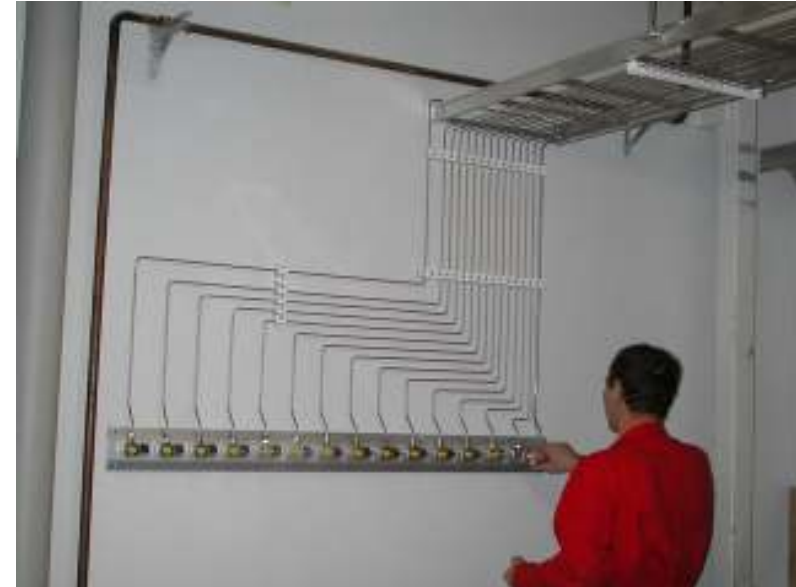
## GAS DISTRIBUTION SYSTEMS

### INSTALLATION TECHNIQUE

Remember! Not only technique,



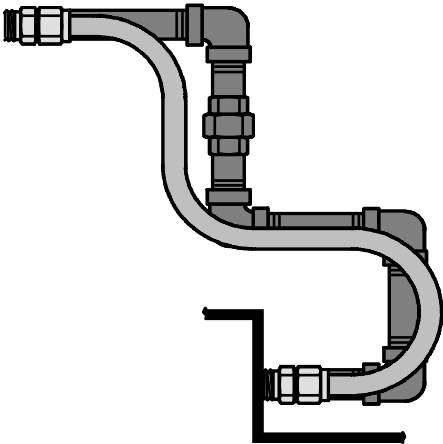
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installation must look good !!



## STANDARD-LEVEL



## LABORATORY-LEVEL

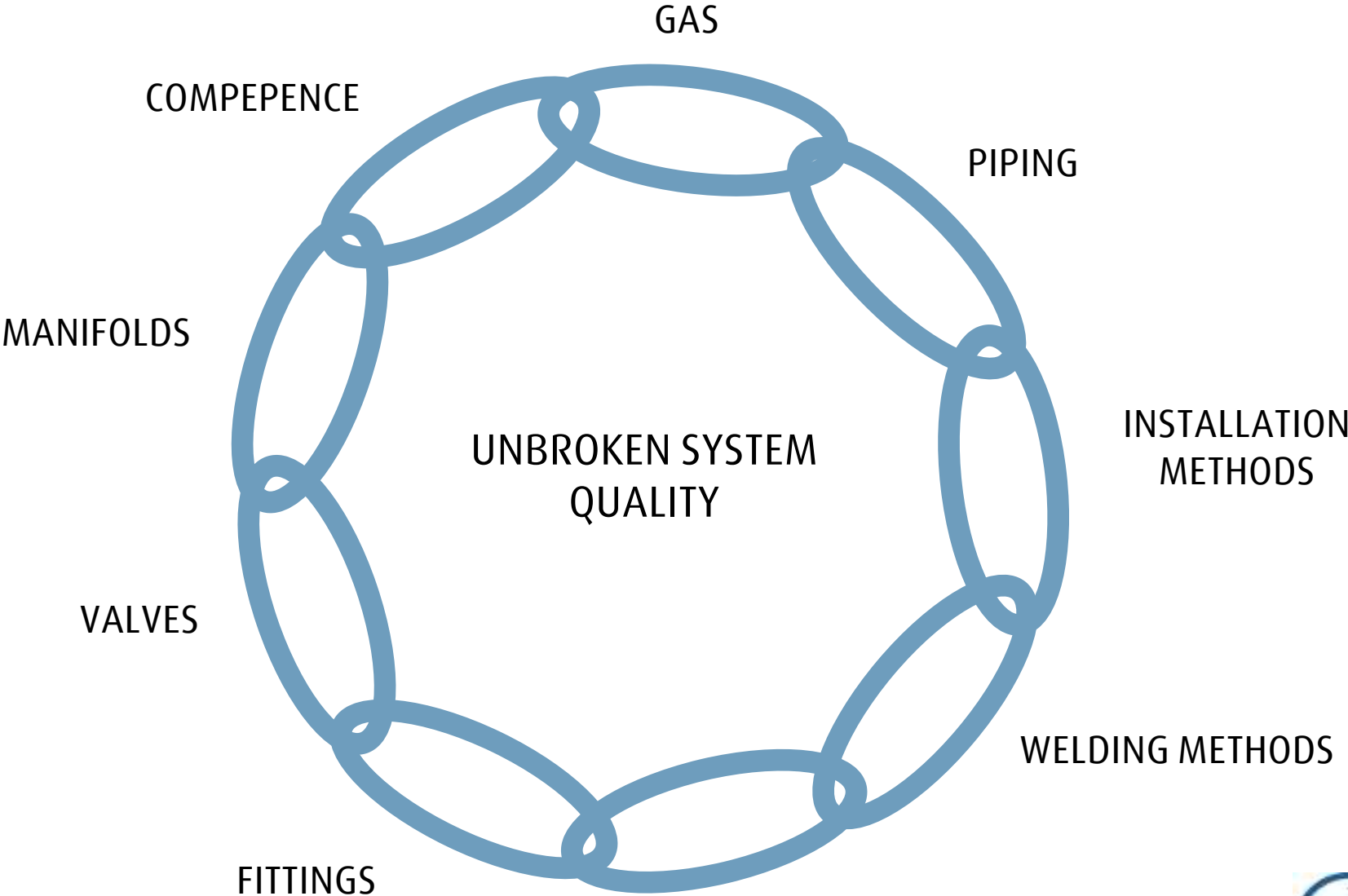


## UHP (Ultra High Purity) - LEVEL



## DIFFERENT LEVELS, DIFFERENT PRICES

	PRICE LEVEL		
	GAS	Pipe/m	Fitting
“STANDARD”	42 €	3 € Rst	2 theard/welded
LABORATORY- LEVEL	130 €	10 € CQ	12 € Swagelok
UHP – TASO	280 €	22 € PQE	35 € VCR



POUs, HookUp!!!

