Training Services

Material Science Training

Make the best choices for your application

Swagelok® Materials Science Training courses teach you how to choose the right corrosion-resistant materials to help you keep your fluid systems leak-tight and operating efficiently. Through this course, you will learn which specific alloys resist corrosion and how they do it, how various materials behave, and how industry standards impact your material choice. Whether you are dealing with sour oil and gas fields or aggressive precursor chemicals for semiconductor manufacturing, a strong understanding of materials science is invaluable.

Available Courses:

- Alloys/Corrosion/Material Selection
- NACE
- Hydrogen
- Elastomer Seals

Alloys/Corrosion/Material Selection:

The objective of this course is to provide an overview of important factors for selecting optimal materials of construction for demanding applications.

Topics covered:

- Important microstructural characteristics of ferritic, austenitic and duplex alloys and their mechanical properties.
- Different forms of corrosion that may lead to a degradation of metals when they are exposed to a seawater environment: general, pitting, crevice, microbial, galvanic, sour gas and chloride stress corrosion cracking.
- The resistance of different alloys to these corrosive threats will be described and compared.
- The selection of optimal materials of construction for various applications will be discussed, including those requiring high pressure ratings, specific use temperatures, high resistance to different types of corrosive threats, and compliance with standard specifications.
- Different alloy options will be presented, including standard, super-austenitic and super-duplex stainless steel, and their advantages and drawbacks will be explained.

NACE

Sour Gas Cracking, also known as Sulfide Stress Cracking (SSC), causes the deterioration of metals which are in contact with hydrogen sulfide (H2S) gas and moisture. SSC may occur in new sour reservoirs and aging reservoirs where seawater has been injected for enhanced oil recovery. The NACE MR0175/ISO 15156 standard describes requirements for the condition of many materials used in sour environments in oil and gas production, including but not limited to 316 and 6-moly stainless steel, duplex and super duplex stainless steels, and nickel alloys 825, 625, C-276, and 400, and various alloys used for high-strength spring wire. This standard also describes the environmental limits – i.e., the maximum temperature, chloride concentration, and H2S partial pressure – to which these alloys can be used. This course will provide an introduction to the NACE MR0175/ISO 15156 standard. Examples of how to apply standard requirement to fluid system components made from the aforementioned alloys will be provided.

Hydrogen

Hydrogen Embrittlement can occur in high-pressure gaseous hydrogen or when atomic hydrogen is generated at a metal surface. Hydrogen atoms can diffuse into metals, making them brittle. All materials susceptible to hydrogen embrittlement are also very susceptible to sulfide stress cracking. Hydrogen embrittlement can be avoided by selecting material resistant to hydrogen, such as austenitic alloys with nickel content between 10% and 30%. This course covers Hydrogen embrittlement, mechanical properties and fatigue behaviour, effect of hydrogen on reduction of area, effect of hydrogen on fatigue behaviour and effect of hydrogen on pressure cycling of components.

Elastomer Seals

This seminar is ideal for associates who are tasked with safely selecting the correct products and seals for their applications, or are actively involved with seeking alternative materials to enhance systems. It is also suited to anyone wishing to gain a greater understanding of Seal Fundamentals.

Topics covered:

- Basic fundamentals.
- Seal Materials (NBR, FKM, FFKM, EPR).
- Chemical Resistance Guides.
- Compatibility with common troublesome media: Steam, Ammonia, Methane/Methanol, Petroleum based, Sour Gas, EO, Refrigerants.

About the Trainer:

Dr. Gerhard Schiroky
Principal Scientist

Gerhard joined Swagelok in 2000 and has been helping customers find solutions to meet their materials requirements ever since. Gerhard has an in-depth knowledge of materials-related industry standards and standard specifications, and he has authored a variety of technical publications on topics such as 316L stainless steel corrosion, the effects of alloy composition, fluid dynamics, and materials science. He routinely provides customers with a better understanding of the NACE MR0175/ISO 15156 international standard for the selection of materials for sour gas applications, and he has developed roadmaps for improved and new alloys from which future fluid system components have been constructed. Gerhard received his doctorate in materials science and engineering from the University of Utah and he has been named on over 20 patents.

Marcy McQuary
Principal product Engineer

Marcy joined Swagelok in 1998. She has a broad depth of knowledge regarding Swagelok products & processes and holds a Mater of Polymer Science degree from University of Akron and a BSc in Chemical Engineering from Youngstown State University. Marcy is a subject matter expert on elastomer seals and a key resource for selecting and specifying seals in Swagelok products.

Please contact Shashi Kumar if you wish to know more about the training options:

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