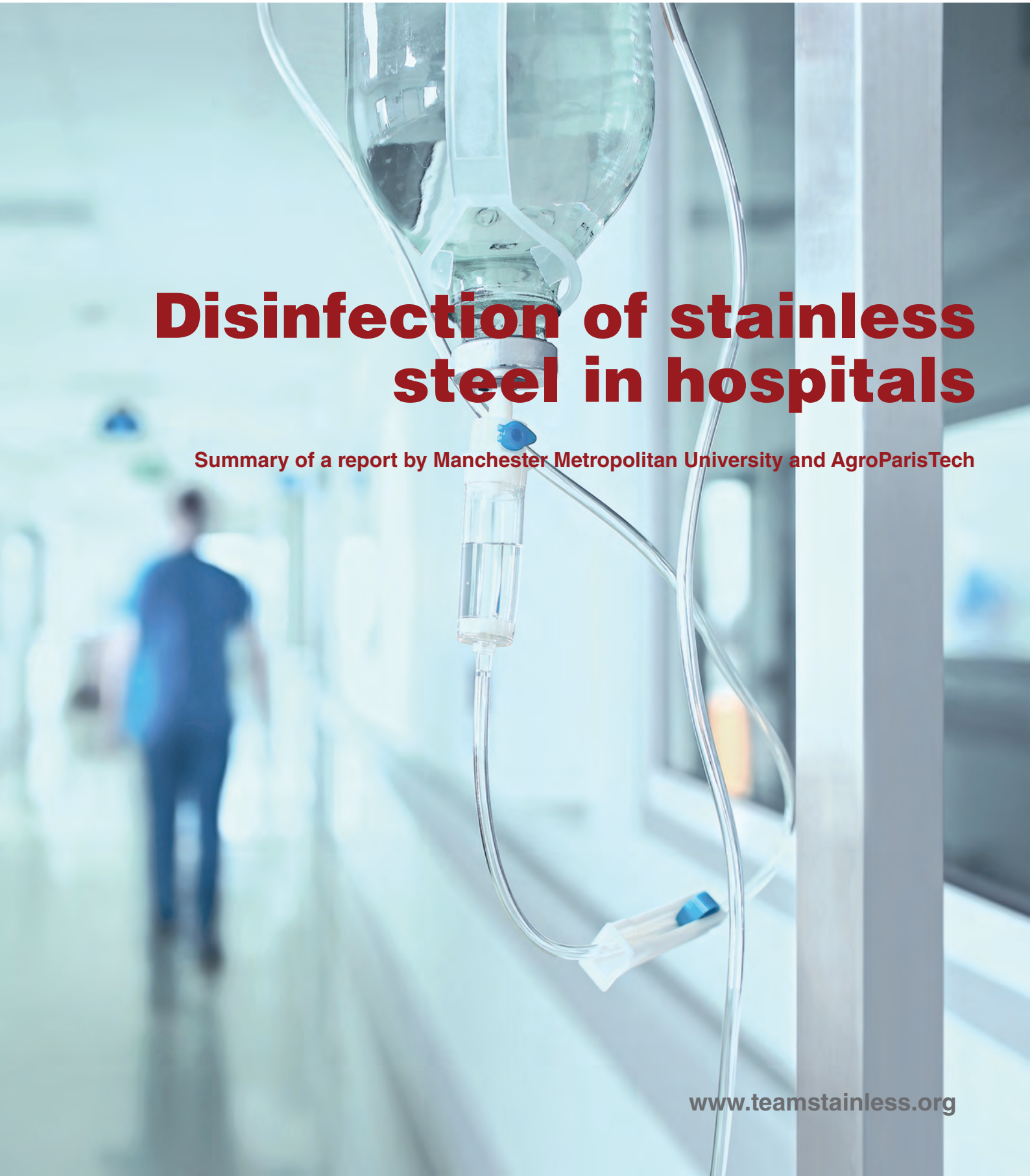
TEAM STAINLESS



Disinfection of stainless steel in hospitals

Summary of a report by Manchester Metropolitan University and AgroParisTech

www.teamstainless.org

Introduction

Thanks to its unique properties, stainless steel is used widely in many applications throughout hospitals and healthcare facilities. It is easy to clean, non-porous and corrosion resistant, even when repeatedly sanitized with harsh chemicals.

We are very proud of the contribution that our industry has made towards keeping hospitals clean, reducing the spread of infection and ultimately helping to save countless lives. In recognition of this heritage, Team Stainless has commissioned this study which, for the first time, examines the effectiveness of disinfection upon aged, as well as new, stainless steel surfaces.

We hope that this study makes a useful addition to the weight of scientific information surrounding the ongoing use of stainless steel in clinical environments.

John Rowe
Secretary-General, ISSF

Team Stainless

is an informal alliance among the International Stainless Steel Forum, International Molybdenum Association, International Chrome Development Association, Nickel Institute, International Nickel Study Group and Eurofer. Its primary functions are to protect existing markets for stainless steel and to promote the many benefits of stainless steel to a sustainable society.

Executive summary

Team Stainless commissioned Manchester Metropolitan University and AgroParisTech to devise and conduct a study to examine the effectiveness of disinfection on stainless steel in hospital environments.

Unlike previous studies, which have only tested the effectiveness of disinfection on **new** stainless steel, this study was specifically designed to test both new and **artificially aged** surfaces. A fouling and cleaning protocol was first designed to replicate the aging effects of multiple cleaning cycles in normal use.

New and aged samples of AISI 304 and AISI 316 (the two grades of stainless steel usually found in clinical environments) with various surface finishes were then contaminated with the bacteria most commonly associated with Healthcare Acquired Infections. The samples were then cleaned using a proprietary disinfectant and analysed for the presence of bacteria.

The study concluded that standard cleaning and disinfection effectively sanitised all tested samples, regardless of grade, surface finish or simulated age. This confirms the continued safety of using stainless steel in hospital environments.

AgroParisTech has expertise in the study of microorganisms and materials interactions using a multidisciplinary approach of microbiology, physico-chemistry and microscopy. The physico-chemical properties of the materials and their role in bacterial contamination are a particular area of study, as well as chemical and physical methods for the decontamination of surfaces.

Manchester Metropolitan University has unique cross-disciplinary expertise in the study of the interactions between microorganisms and inert surfaces. This is specifically in the production and characterisation of surfaces and the development of methods to assess interactions with microorganisms. The team has a particular interest in the effect of surface topography and the effect of wear on the hygienic status of different stainless steels. They have also developed and assessed a range of different antimicrobial surfaces.

Laboratories ANIOS has developed partnerships with hospitals and clinics for more than 50 years to offer a complete range of products and materials for cleaning and disinfection.

The context

The World Health Organization lists Healthcare (or Hospital) Acquired Infections (HAIs) as the most frequent adverse effect in healthcare delivery, affecting hundreds of millions of patients worldwide every year. HAIs are defined as infections affecting patients in a hospital or healthcare facility which were not present or incubating at the time of admission.

In operating theatres, intensive care units and other areas where infection control techniques and hygiene are at their highest, the risk of HAIs is very low. However, the very strict procedures adhered to in these areas are unsustainable across an entire hospital or healthcare facility. Therefore bacteria are commonly found in patient areas such as hospital rooms and wards. Some bacteria can survive for several weeks and can be spread to other patients through day-to-day contact and ordinary activities. A study in 2004 identified microorganisms in patient bathrooms and showers, and on beds, tables, handrails, walls and floors.

In the context of growing antibiotic resistance, it has never been more important to ensure that surfaces and objects in all patient areas can be easily cleaned and disinfected. Stainless steel has played a key role in clinical safety in hospitals for many decades. It is chemically inert, non-toxic and can be manufactured into smooth, non-absorbent surfaces which can be thoroughly cleaned, disinfected and sterilized safely without degradation or corrosion.

The study

Manchester Metropolitan University and AgroParisTech were commissioned to devise and conduct a study to examine the disinfection of stainless steel for use in hospitals. Expert advice and proprietary cleaning products were provided by Laboratoires ANIOS, an internationally renowned supplier of anti-microbial cleaning products and hygiene services.

Pseudomonas aeruginosa

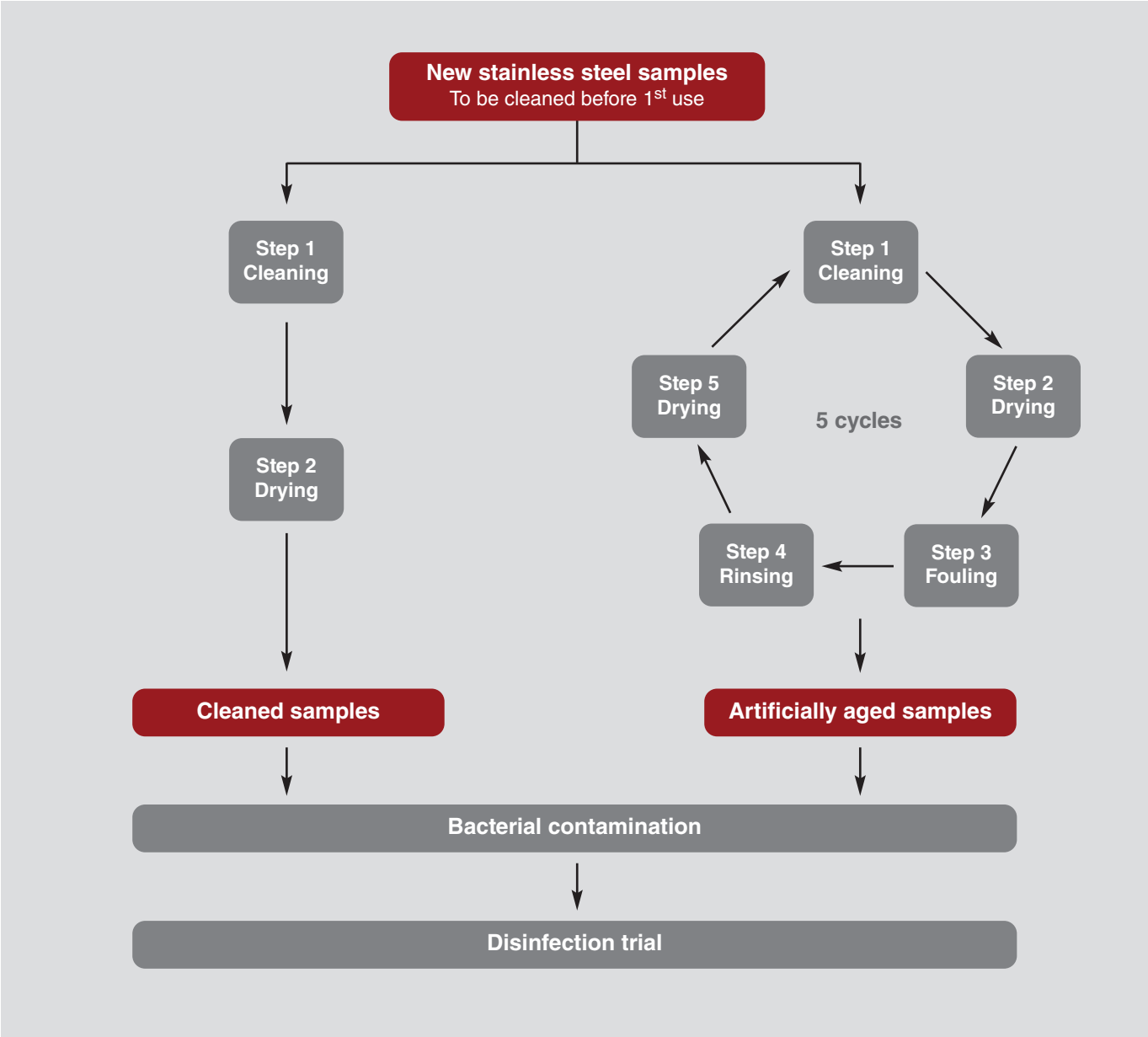
Staphylococcus aureus

Most of the existing research to assess the effectiveness of biocides and disinfectants has been carried out on new surfaces. This study was specifically designed to assess effectiveness on both new and aged surfaces. In order to achieve this, a robust protocol to simulate aging and then to test the effectiveness of disinfection on both new and aged materials was developed. A significant proportion of the study was devoted to developing this protocol to ensure consistent, objective and repeatable results.

A cycle of fouling and cleaning was developed to simulate aging, after comprehensive research to select the most appropriate fouling solutions, disinfectant and cleaning methods. Samples of two grades of stainless steel most commonly found in hospital environments – AISI 304 and AISI 316 – were sourced with four and three different surface finishes, respectively.

Stainless steel 304 and 316 samples in different finishes

The stainless steel samples were then divided into two groups, with samples of each grade and finish in both groups. The first group of samples were cleaned once, while the samples in the second group were fouled and cleaned five times to simulate aging in accordance with the developed protocol.



Both new and aged stainless steel samples were then contaminated with two types of bacteria which cause the majority of HAIs – *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

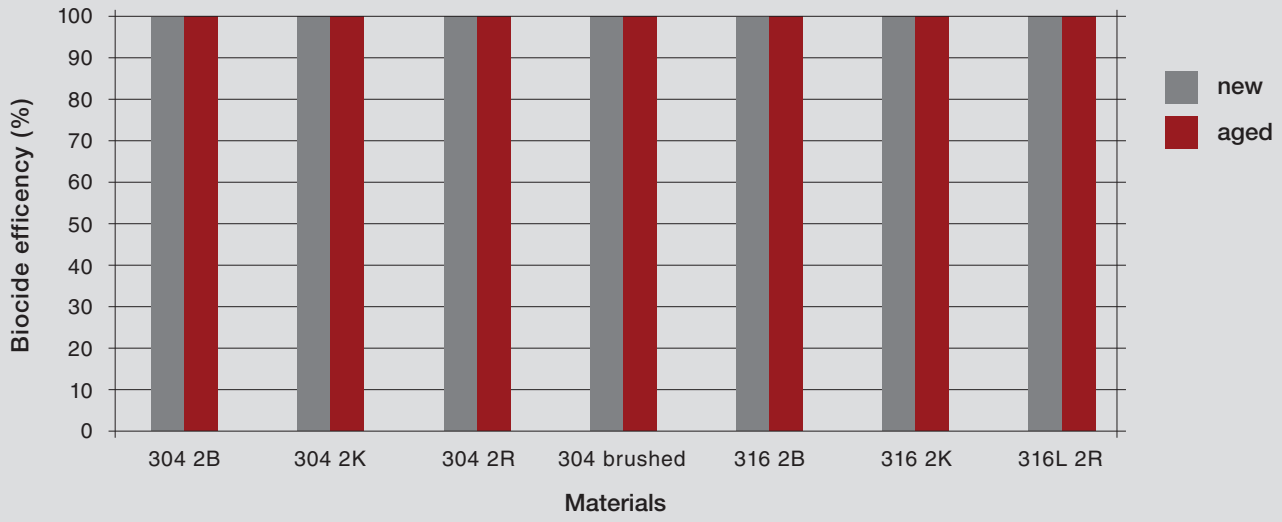
Staphylococcus aureus is the most pathogenic of the Staphylococcus genus and is responsible for food poisoning, suppuritive localized infections, and can in extreme cases prove fatal. *Pseudomonas aeruginosa* is very prevalent, highly resistant and one of the most difficult to treat.

Both sets of stainless steel samples were then cleaned with Surfa'Safe Premium, a proprietary product of Laboratoires ANIOS, in accordance with the protocol, and assessed for remaining levels of bacteria.

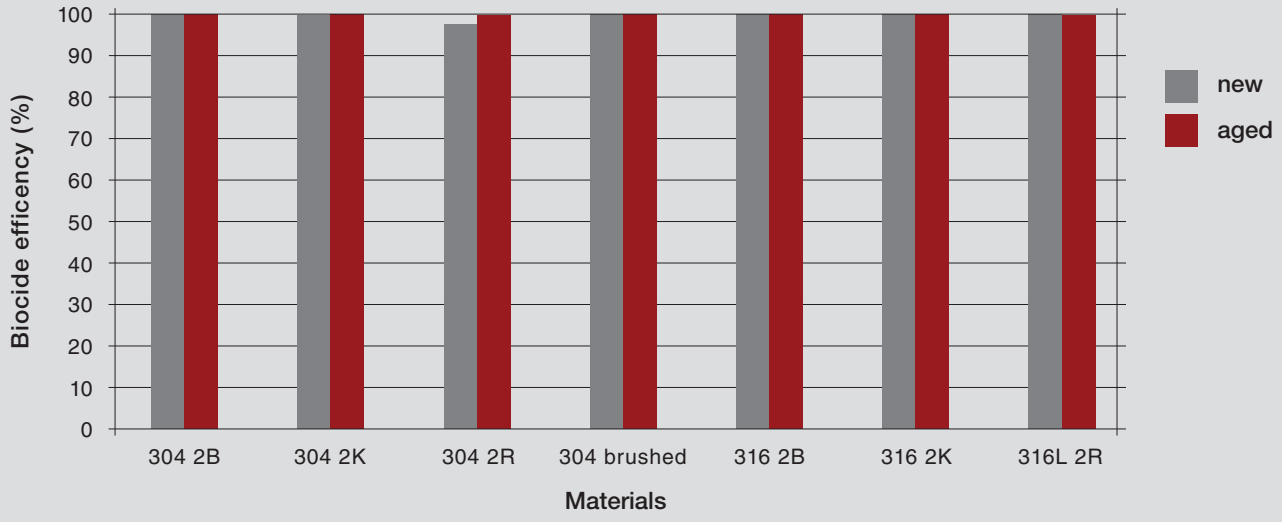
Results

The efficiency of disinfection was measured and recorded. As the barcharts illustrate, the disinfectant was 99.9% effective against *Staphylococcus aureus* and 97.6% effective against *Pseudomonas aeruginosa* after five minutes contact.

Staphylococcus aureus



Pseudomonas aeruginosa



Importantly there was no discernible difference between the efficiency of disinfection across the range of grades and finishes and whether or not the stainless steel was new or aged.

This confirms the effectiveness of disinfecting stainless steel against bacteria associated with HAIs and its ongoing suitability as a material for use in clinical environments.

TEAM STAINLESS

ISSF INTERNATIONAL STAINLESS STEEL FORUM

IMOA INTERNATIONAL MOLYBDENUM ASSOCIATION

Nickel INSTITUTE

INSG

EUROFER The European Steel Association

Stainless

icda

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