



Author Guide

Preparing a technical paper for *AISTech* for
the Association for Iron & Steel Technology



TO ADVANCE THE TECHNICAL
DEVELOPMENT, PRODUCTION,
PROCESSING AND APPLICATION
OF IRON AND STEEL

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Introduction

These guidelines have been developed to assist authors with the preparation and submission of their technical papers for Association for Iron & Steel Technology (AIST) Conference Proceedings.

It is the goal of the AIST to advance the technical development, production, processing and application of iron and steel. To this end, it is important to achieve a high degree of quality and uniformity with published papers. AIST requires papers to be submitted electronically with full text and images.

***Please read all instructions
BEFORE preparing the paper***

Writing and Organizing the Paper

Authors must carefully proofread material before submitting papers for publication. Papers will be checked for content and formatting guidelines. Basic spelling and grammar will be checked in the title only. Papers must be in the proper format and be suitable for publication when submitted. Non-adherence to instructions will cause the paper to be returned to you for editing. Paper must be resubmitted in a timely manner to ensure publication. We recommend that non-English-speaking authors have their work edited and proofread by someone fluent in English to ensure clear communication of the information in their paper.

Commercialism Policy

Papers and presentations delivered at AIST-sponsored forums are intended to be technical in nature, with solutions supported by verifiable data. Commercially motivated commentary or endorsement of specific brands or companies is not acceptable. Each paper/presentation will be peer-reviewed by forum organizers to ensure compliance with this policy. If the paper/presentation is deemed to be in violation, the author/presenter will be notified by the forum organizer(s) and given the opportunity to revise the content or to withdraw the paper/presentation. To preserve and protect the interests of AIST, forum organizers will have the authority and the responsibility to stop any paper/presentation they determine to be in violation of this policy.

Permissions/Releases

It is the author's responsibility to acquire any necessary permissions before submitting the paper to AIST. Once the paper has been submitted, you must assume the paper will be published. AIST is not responsible for any issues that may arise concerning the content of your paper.

Submission Deadline

Your finished paper is due to AIST by 16 February 2014. Strict adherence to the deadline must be emphasized, otherwise AIST cannot guarantee publication.

Submission Requirements

Cover Letter

A letter of transmittal, with author(s) name(s), address(es), telephone and email address must accompany each paper when submitted for publication. Indicate the name of the conference for which the paper is being submitted and the title of the session. Once submitted, manuscripts are the property

of AIST and will not be returned. Authors are advised to make additional copies of their manuscripts for their own use prior to submission.

Copyright

A signed and completed copyright transfer and permission to publish form — Copyright Transfer to Publish: Authorization for Papers Submitted for Publications by the Association for Iron & Steel Technology — must be submitted with the original manuscript. A written transfer of copyright is necessary under U.S. Copyright Law for AIST to grant permission to reprint from published volumes. However, the transfer of copyright from the author to AIST, as well as permission to publish, is implied in the act of submission of the manuscript.

Submission Method

AIST requires all papers to be submitted electronically with full text and images. Electronic submissions will be accepted via email or a file-sending website similar to Dropbox.com or HighTail.com. **Submissions must be in Microsoft Word format.** Electronic copy must be clearly labeled with title of paper, author(s), conference title and session name. PowerPoint presentations are not acceptable for publication. It is not necessary to submit hard copy originals unless it is requested by AIST for clarification of information or images. See formatting instructions.

Multiple Submissions

Before submitting your paper, please review the content to be certain it reflects your intent and obtain any permissions/releases that may be necessary. Repeatedly sending corrected copies of your manuscript may cause the wrong submission to be published.

Guidelines for Writing the Paper

The following general outline should be used as a guide for organizing a paper:

- Title
- Author Name(s) and Affiliation(s)
- Keywords
- Introduction
- Text, Tables and Figures (inserted within text)
- Conclusions
- Acknowledgments
- References
- Appendices (optional)

Please see sample paper accompanying this guide.

Title

The title should highlight the main theme of the paper and be as short and concise as possible.

Author(s) Name(s) and Affiliation(s)

List the author's full name (first name, middle initial, surname) and those of any co-authors. Do not use any courtesy titles other than Sr. or Jr. Also include name, address, phone and fax numbers and email address of the company with which the author and co-authors are affiliated.

Keywords

Keywords will be used for online search engines. A list of six to eight keywords that categorize the paper should be provided and placed centered on the page, immediately following the author(s) name(s) and affiliation(s) on the first page.

Introduction

The introduction should give a brief overview of any procedures, problems and conclusions presented in the paper.

Text, Tables and Figures

Editorial comments, commercialism or endorsements of any products are not acceptable. Use of company logos is not permitted. Tables and figures must be incorporated into the text where referenced and centered between text. Do not use text wrap or offset images. All information contained in the tables and figures must be written in English.

Conclusions

This section should briefly review the most significant information and summary of the paper. A well-written conclusion should be no more than one paragraph.

Acknowledgments

This section should be brief and written in the first person, using "I" or "we."

References

Please refer to "Formatting Instructions" below for more comprehensive directions on how to create references. Formats and examples are cited in this section.

Appendices

An appendix is a listing of material (graphs, books, illustrations) related to the text, but not suitable to be included in it. Material in an appendix should be related to one topic, and each topic should form a separate appendix.

Page Numbers

Do not incorporate page numbers into electronic files. Pages should flow sequentially without page numbers marked.

Paragraphs

Do not indent text. It is not necessary to double-space between paragraphs, although it is preferred that you double-space between sections of the paper (see sample).

Formatting Instructions

Paper Length

The average length of a paper for AIST Conference Proceedings is 10 pages. Please keep your paper in the range of 8–12 pages.

Page Dimensions and Margins

Manuscripts are to be electronically submitted with page setup at 8.5 x 11 in. (21.6 x 27.9 cm). Do not use A4 sizing in electronic files. Please adhere to the following margins:

- Top: On the first page, the title of the paper should begin 1.75 in. (4.45 cm) from the top of the page. A 0.5 in. (1.27 cm) margin should be used on the top of the following pages.
- Left: 0.75 in. (1.905 cm)
- Right: 0.75 in. (1.905 cm)
- Bottom: 1 in. (2.54 cm)

The text of the paper should be typed in one-column, single-spaced format, 10 pt. Times New Roman. Do not indent paragraphs.

First Page

Title — Using 12 point Times New Roman, bold, type the title in capital and lowercase letters (not all caps), centered, using more than one line to complete the title if necessary.

Author(s) Full Name(s) — Using 10 point Times New Roman, center the author(s) full names two lines below the title, using capital and lowercase letters.

Author(s) Affiliation(s) — Using 10 point Times New Roman, center the full name, address, phone and fax numbers and email addresses of the author's name, using capital and lowercase letters. If there are co-authors, repeat these instructions for each additional author.

Keywords — Using 10 point Times New Roman, list six to eight keywords two lines below the author(s) name(s) and affiliation(s), centered, using the heading "Keywords."

Introduction — Using 10 point Times New Roman, begin typing the introduction heading two lines below the keywords, centered and bold in capital letters.

Headings and Subheadings — Using 10 point Times New Roman, center major headings in capital letters and bold. Using 10 point Times New Roman, subheadings should be bold and placed flush left with a capital letter beginning each word. Subheadings of subheadings, if used, should be bold and indented five spaces. Capitalize only the first word of the sub-subheading.

First Line of Text — Do not indent. Do not underline.

Preparation of Tables and Figures

Do not put boxes around the figures.

Tables — All tables must be placed within the text of the paper as close to the text reference as possible. An extremely wide table may be turned on one of its longer sides, with the table heading centered directly above the table. Do not include tables that depend on color for meaning. The CD-ROM of proceedings will show color, but the print version will be black and white only. Include headings above all tables. Any symbols used in a table must be defined in a formal nomenclature immediately following the table in which they are mentioned. Each table must have a caption typed directly above it along with the table heading.

Figures — All line drawings, photographs and halftones must be placed within the text of the paper as close to the text reference as possible. Photocopies of figures reproduce poorly and are not acceptable. Do not include figures that depend on color for meaning. The CD-ROM will show color, but the print version will be black and white only.

Line Drawings — Line art must be computer-generated. Lettering must be in English and legible.

Halftones — These are reproductions of a photograph into a

dot pattern. The screening process can be done by a printer or graphic art photographer. A 100-line screen is best to use when having halftones made from photographs. Photographs must be screened before they are used within the text of the paper. Color photographs may be used, since the CD-ROM of proceedings will show color. However, the print version will be in black and white only. Each figure must have a caption typed directly below it. Captions are single-spaced.

Numbering Tables and Figures — Number tables with Roman numerals according to their order of appearance in the text. Example: Table I, Table II. Number figures with Arabic numerals. Example: Figure 1, Figure 2. In appendices, do not continue the numbering sequence from the text of the paper, but number tables and figures as: Table A-1, Table A-2, Figure A-1, Figure A-2, etc.

Equations

Equations are set off from the text by a double space both above and below the equation. Equations are numbered with Arabic numerals, with the numerals placed in parentheses directly across from the last line of the equation, at the right-hand margin. List and define equation symbols in a nomenclature immediately following the equation.

Abbreviations

If there is any doubt concerning the abbreviation of a term or word, spell it out. For long terms or names that will be used more than once, spell them out on the first reference, place the abbreviation in parentheses immediately after the term or name, and use the abbreviation on all further references. Abbreviations for weights, distances, heights and other measurements can be found in most standard English dictionaries.

Use of Metric Units

Either SI metric or imperial units of measure may be used in the paper; however, use one or the other consistently, rather than a combination. A conversion factor table at the end of the paper should list the factors necessary to convert from one system of units to another, if needed.

References

Reference numbers within the text are placed immediately after the final word or punctuation mark of the sentence in which the reference is first mentioned. The reference number is placed slightly above the line of type (superscript). Use Arabic numerals for all references.

Each paper must include a complete list of references, numbered consecutively in their order of appearance within the text. Single space all reference entries. Examples of references follow:

Article — Name(s) of author(s), article title (in quotations), publication title (in italics), volume, number, date and inclusive pages.

1. J.A. Bartnik and C.F. Giermark, "Chemical Magnetic Flocculation Process," *The Canadian Mining and Metallurgical Bulletin*, Vol. 62, No. 3, June 1969, pp. 263-266.

Book — Name(s) of author(s), chapter title (in quotations), book title (in italics), name of publisher, city and state or country of publication, date of publication and inclusive pages.

2. M.X. Misal, "Crankcase Oil as an Edible," *Physical Principles of Oil Production*, McGraw-Hill Co., New York, N.Y., 1949, pp. 27-30.

Unpublished Paper — Name(s) of author(s), title of paper (in quotations), name of conference at which paper was presented (in italics), city and state or country in which conference was held and date of conference.

3. W.H. Bailey, "Refining and Casting of Large Forging Ingots," *Metals Society Conference*, Sheffield, England, July 1975.

For all reference entries, author name(s) should be listed as follows: first initial, middle initial and surname.

Appendix

If an appendix is included in the paper, follow the instructions appropriate to the material. Each topic should be listed as a separate appendix, and each appendix labeled with a Roman numeral (Appendix I, Appendix II, etc.)

12 point Times New Roman,
bold, centered, title case

A Study of Ca-Modification Process in Al-Killed Steels

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Keywords: HIC, Clogging, Ca modification, Alumina, Spinel, ASPEX.

INTRODUCTION

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bold, centered, all caps

The required steel cleanliness levels depend on the application. As a rule, the smaller the cross section particularly thickness, the more critical is the inclusion size, distribution, morphology, and composition. Inclusions not only deteriorate the mechanical properties of the final product but also disrupt steel making process by nozzle clogging and buildup. In recent years, with the growing demands for high quality materials, the acceptance criteria for steel cleanliness has evolved. Conventionally, cleanliness analysis is performed by means of micro/macrosopic test methods [e.g., 1]. With the new advanced techniques, a comprehensive cleanliness evaluation of non-metallic inclusions characteristics such as quantity (to a size of about 1 micron), distribution, type, and morphology by SEM automated inclusion analysis [e.g., 2] is now possible.

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Roman, justified

EXPERIMENTAL PROCEDURE

In this work, inclusion modification trials were made on various sequences for two main reasons;

- To optimize the addition of Ca to prevent SEN clogging
- To assess the effect of inclusions on HIC performance

Heats were prepared in a 135 tonnes electric arc furnace (EAF) and then transferred into the ladle for secondary metallurgy at 1650-1675°C. After tapping, a slag refining premix is added. Following tapping, the ladle is transferred to the ladle metallurgy furnace (LMF), and the steel is de-oxidized by using aluminum ingots and alloy additions are made. By effectively stirring the ladle and raising the temperature to about 1650°C, desulfurization is carried out to completion. When the heat is within the chemistry limits, calcium silicon (CaSi) is injected from a refractory lance followed by post injection plug stirring for 3 minutes for inclusion modification and floatation. The heat is transferred to the slab caster after the heat is processed at the LMF for approximately 60 minutes.

RESULTS AND DISCUSSION

The chemistry of selected heats is shown in Table 1. As indicated, the CaSi addition was varied from 50 to 80 Kg per heat or about 0.4 to 0.6 Kg of CaSi per ton. As shown, the aluminum content for these heats is typical of an Al-killed heat. Also the final sulfur contents for all heats were below the target level, i.e. 50ppm.

Table 1. Chemical compositions, final sampling (wt%)

	C	Mn	S	P	Si	Al	Ca	Ti	N	O
H1	0.174	0.78	0.0036	0.012	0.17	0.038	0.0026	0.017	0.0104	0.0045
H2	0.173	0.77	0.0038	0.01	0.19	0.037	0.0037	0.018	0.0114	0.0059

Ca Modification Process

The Ca modification process is efficient if low m, however at certain level of Ca, CaS will begin to precipitate and some resulfurization might occur.

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m, however at certain level of Ca, CaS will begin to precipitate and some resulfurization might occur. S as well as liquid and solid inclusions. The percentage of liquid and 50:50 liquid inclusions drastically decreased by extra addition of CaSi material for heat S3, 120Kg of CaSi (sequence A).

CaSi material

The Ca modification process is efficient if low m, however at certain level of Ca, CaS will begin to precipitate and some resulfurization might occur.

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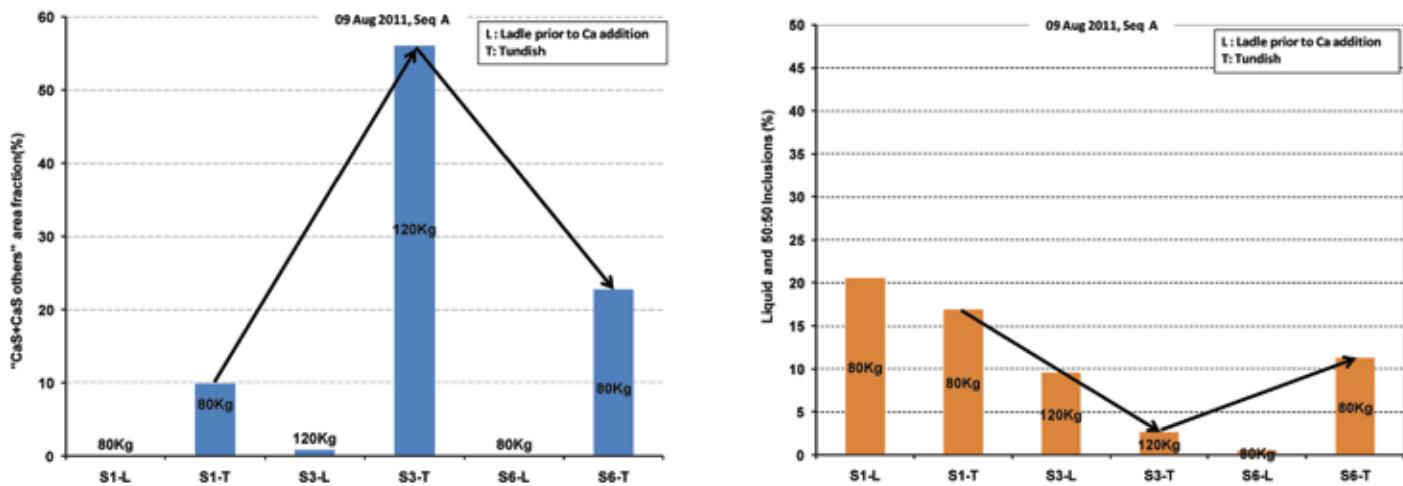


Figure 1. (a) area fraction of CaS inclusions, (b) percentage of liquid and 50:50 liquid inclusions

CONCLUSIONS

The production of two steel grades for oil and gas pipe applications was studied. It was found that the amount, type, stirring, sulfur levels and processing parameters are key factors for the efficiency of desulfurization process. For API 5CT , grade J55, with sulfur levels less than 50 ppm, addition of 50Kg per heat is more desirable for promoting more liquid inclusions in comparison to 80Kg injection.

In the second trial, correlation between addition of CaSi and HIC performance for API 5L grade X52 was investigated. It was found that excessive addition of calcium not only lead to clogging of the nozzle and tundish gate plates, but also proved to be deleterious to HIC resistance as it led to significant quantities of calcium-rich particles. Most of the issues are addressed by modifying the process parameters. As well work is in progress to use new materials.

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REFERENCES

- ASTM E45-05, Standard Test Methods for Determining the Inclusion Content of Steel, ASTM International, 2009
- V. Singh, S. Lekakh, T.J. Drake, K.D. Peaslee, "Process Design of Inclusion Modification in Cast Steel using Automated Inclusion Analysis," AISTech 2009