**INTRODUCTION**

South Africa has a proud history in the production of both mild steel and stainless steel with production facilities in Gauteng, Kwazulu-Natal, Mpumalanga, the Eastern and Western Cape provinces. At these facilities steel is produced from scrap or from ore via ironmaking facilities.

The Center for Iron and Steelmaking Research at Carnegie Mellon University in Pittsburgh, Pennsylvania, USA has a proud history on iron and steelmaking. Collaboration between CMU and the South African iron and steel industry includes a school on steelmaking presented by Prof. Richard Fruehan in Vanderbijlpark in 1996.

At Clean Steel 2016 Prof. Chris Pistorius will continue the collaboration by addressing the following topics:

**CONTROLLING DISSOLVED ELEMENTS**

1. What is clean steel?
2. Relevant process conditions in blast furnace, steelmaking converter, electric arc furnace, ladle furnace and caster (temperatures, oxygen activity, slag basicity, stirring).
   a. Sources (raw materials; environment)
   b. Thermodynamic and kinetic principles of control
   c. Practical control methods:
      i. hot metal desulfurization and dephosphorization
      ii. metal-slag reactions in blast furnace, steelmaking and ladle
      iii. clean tapping
      iv. metal-gas reactions, including nitrogen pick-up
      v. deoxidation
      vi. role of slag
      vii. mitigating the surface quality effects of Cu & Sn.

**CONTROLLING MICRO-INCLUSIONS**

1. Principles of control:
   a. inclusion composition evolution over time
   b. removing inclusions to slag or fluxes: gas stirring and flotation kinetics
   c. inclusion-metal-slag reactions: equilibria and kinetics (spinel formation)
   d. calcium modification.
2. Sources of micro-inclusions:
   a. deoxidation and reoxidation products
   b. ladle glaze
   c. inclusions in ferro-alloys and ferro-alloy reaction products
   d. mold flux entrainment
   e. reoxidation.
3. Assessing micro-inclusions:
   a. overall steel composition
   b. caster behavior
   c. microanalysis (polished sections; extracted inclusions)
   d. other analytical approaches.
4. Summary: general guidelines for clean-steel practice; opportunities to learn more and share information.

**WHO SHOULD ATTEND**

The school is aimed at delegates from steel producing companies in South Africa or those who support them, and includes:

- Senior management
- Middle management
- First line management
- Process/production engineers
- Design engineers
- Researchers

**EXHIBITION/SPONSORSHIP**

Sponsorship opportunities are available. Companies wishing to sponsor or exhibit should contact the Conference Co-ordinator.

---

**LECTURER**

**Prof. C Pistorius**

Chris Pistorius is the POSCO Professor of Iron and Steelmaking in the Department of Materials Science and Engineering at Carnegie Mellon University (Pittsburgh, PA, USA), where he has been since 2008. Previously he was Professor and Head of Department of Materials Science and Metallurgical Engineering at the University of Pretoria. He holds Bachelor’s and Master’s degrees in Metallurgical Engineering from the University of Pretoria, and a PhD from the University of Cambridge, United Kingdom. His current research interests include the fundamentals of ironmaking and steelmaking reactions, and electrochemistry of corrosion and metals production.

---

**Photographs courtesy of Jason Pieterse and Chris Pistorius**

---

**Poster Competition**

Abstract Submission
Deadline 1 June 2016
Prize: An overseas trip to work with Prof. Pistorius at CMU in Pittsburgh
Day 1—Monday 25 July 2016

07:30–08:30  Registration opens and early morning refreshments
08:30–08:35  Emergency Procedures
08:35–08:45  Opening by Conference Chairperson
               Joalet Steenkamp
08:45–09:00  SAIMM Presidential Address
               R.T. Jones
09:00–09:30  Lecture: What is clean steel?
               Chris Pistorius
09:30–10.20 Lecture: Relevant process conditions
               (blast furnace, steelmaking converter,
               electric arc furnace)
               Chris Pistorius
10.20–10.30 Sponsor Presentation
10.30–10.50 Mid-morning refreshment and presentation of posters
10.50–12.10 Lecture: Relevant process conditions
               (ladle furnace, degasser and caster)
               Chris Pistorius
12.10–12.20 Sponsor Presentation
12.20–13.20 Lunch
13.20–14.50 Lectures: Control of dissolved elements
               Chris Pistorius
14.50–15.10 Mid-afternoon refreshments and presentation of posters
15.10–16.40 Lectures: Control of dissolved elements
               (cont.)
               Chris Pistorius
16.40–17.00 Closing Remarks of Day 1
17.00–18.30 Networking cocktail function and adjudication of posters

Day 2 – Tuesday 26 July 2016

07:00–07:30  Registration opens
07:30–07:40  Opening by Conference Chairman
               Joalet Steenkamp
07:40–09:00 Networking Breakfast & Presentation on
               History of Iron- and Steelmaking in South
               Africa
               Harry Delport
09:00–10.20 Lecture: Principles of control
               Chris Pistorius
10.20–10.30 Sponsor Presentation
10.30–11.00 Mid-morning refreshment and presentation of posters
11.00–12.20 Lecture: Sources of micro-inclusions
               Chris Pistorius
12.20–12.30 Sponsor Presentation
12.30–13.30 Lunch
13.30–15.00 Lecture: Assessing micro-inclusions
               Chris Pistorius
15.00–15.30 Mid-afternoon refreshments and presentation of posters
15.30–16.30 Lecture: Summary
               Chris Pistorius
16.30–17.00 Closing remarks and announcement of
               Prize Winner
SCHOOL
PRODUCTION of CLEAN STEEL
25–26 July 2016
Mintek, Johannesburg

PERSONAL DETAILS
Title ........................................ First Name .................................. Other Initials ........ Surname/Family Name ...................................................
Preferred Name (for use on name badge) .................................................................
Company ................................................ Designation ........................................
Company VAT Registration (Compulsory—SA companies) ...................................... Order No ...............................................
Invoice Address ...........................................................................................................
.................................................................................................................................
.................................................................................................................................
Tel/Cell: ..................................... Fax: ....................................... E-mail: ..............................................
Accompanying Persons Name ...........................................................
SAIMM Membership No. .................................. Are you a presenting author? ........... Do you require an invitation for visa purposes? ........

Please note: Non-members who have not previously been members of the SAIMM are entitled to free membership up to 30 June 2017, for attending this school.

REGISTRATION FEES — All prices are inclusive of VAT.
Please indicate your choice by (√) tick).
Authors: attend the school at no charge
SAIMM Members R5 200
Non Members R5 800
Students/Retired Members R3 000

REGISTRATION ONE DAY: R3 300.00
Delegates may also attend the school for ONE day only
Please indicate (√) tick) which day you will be attending,
Monday—25 July 2016 OR Tuesday—26 July 2016
Registration fees include attendance at technical sessions, cocktail parties, all refreshments and lunches, CD of all presentations presented at the school, and delegate material.

Cancellation and transfer policy:
Delegates unable to attend the event may send a substitute delegate in their place. Please send written details of substitution. Written cancellations must be received more than 10 working days prior to the date of the event and will be liable for 50% of the event fee. Failure to cancel, or cancellation received 10 working days or less prior to the event date, will result in liability for the full event fee.

SOCIAL FUNCTIONS
Welcome cocktail party (Monday 25 July 2016)
Please indicate (√) tick) for catering purposes if you will be attending this function (included in the registration fee for all fully registered delegates and students).
Payment required for additional guests only R300 each YES (√) I will be attending (registered delegates)
Networking breakfast (Tuesday 26 July 2016)
Please indicate (√) tick) for catering purposes if you will be attending this function (included in the registration fee for all fully registered delegates and students).
Payment required for additional guests only R300 each YES (√) I will be attending (registered delegates)
Special requirements — Please advise of any special requirements for diet, health or physical disabilities.

PAYMENT
Please include payment itemised as follows:
Conference registration fee R ..................
Social functions:
Networking breakfast R300 (guests) R ..................
Social functions:
Cocktail function R300 (guests) R ..................
TOTAL R ..................
Cheques—Please find enclosed a cheque/money order (in SA rands) payable to SAIMM or Credit Cards—Please debit (√) tick) my:
Visa ❐ Mastercard ❐ American Express ❐ Diners Club ❐
Card No. ........................................
CVC authorisation (last 3 digits on the back of the card) ........................................
Expiry date: ........................................
Signature: ..............................................

Please print name of cardholder: ..............................................

Payment: Full payment is due on application for registration. Registration will be confirmed ONLY after payment is received. PROOF OF PAYMENT with your invoice number reflected must be sent via fax or e-mail to the Conference Co-ordinator. Delegates who have not paid will not be permitted to attend the conference.

Our banking details are:
Bank: Standard Bank
Branch Code: 000205
Account Type: Cheque Account
Swift No. SBZAZAJJ

2 ECSA CPD points will be allocated to all attending delegates
PURPOSE OF THE COMPETITION

a. To promote technical expertise in the field of clean steel production in South Africa, by encouraging researchers, scientists, technicians and engineers to actively pursue this specialist field.
b. To promote collaboration between the South African steel industry (as defined in the broadest sense possible) and the Centre for Iron and Steelmaking research at Carnegie Mellon University (CMU).

c. To promote collaboration between the South African steel industry (as defined in the broadest sense possible) and the Centre for Iron and Steelmaking research at Carnegie Mellon University (CMU).

d. To promote technical expertise in the field of clean steel production in South Africa, by encouraging researchers, scientists, technicians and engineers to actively pursue this specialist field.

ELIGIBILITY AND REQUIREMENTS TO ENTER

a. An abstract (300 words maximum) must be submitted to be evaluated by the organizing committee. The purpose of the abstract will be to determine whether the project is suitable for the competition (taking into account the possibility of extending the work when the winner visits CMU).
b. Registered fulltime or part-time students (under- and postgraduate) are encouraged to enter, although this is not a requirement to enter the competition.
c. Proof of South African citizenship (copy of I.D. document) or permanent residence should be provided.
d. Topics can include anything related to production of clean steel as defined in the broadest sense possible.
e. Topics should be applicable to industry or industry related problems. Presenters should demonstrate how the project assisted the steel industry in becoming more competitive in the world market with regards to quality and price.
f. Topics should show the application of the scientific / engineering method. Presenters should demonstrate how fundamental theory was applied in solving the problem related to their project.
g. Members of the organizing committee (from July 1st 2014 onwards) of Clean Steel 2015 are not allowed to participate in the competition.

POSTER REQUIREMENTS

a. Entrants should remain at their posters to present them to delegates during all tea and coffee breaks of the school.
b. Entrants should be available for questions that arise from the judges during the scheduled adjudication session.
c. Posters should be A0 size and laminated in matte.
d. A poster template and guidelines will be provided. The poster template and guidelines should be seen as guidelines, not as rules.
e. The poster must, however include the following (should be seen as rules):
   i. Title.
   ii. Name of author and affiliation.
   iii. Introduction (stating project background, problem and objectives of the study).
   iv. Materials and/or methods (stating trial run conditions where applicable).
   v. Results and discussion (tables, graphs, charts, etc).
   vi. Conclusions (which can include recommendations).

JUDGES AND JUDGING CRITERIA

a. There will be three judges, the winner will be determined by the combined scores of the three judges; should there be a tie, the judges will vote on the matter: if 2 out of 3 judges agree on the winner, the decision is final. If not resolved, the conference organizer will decide on the winner, taking into account the scores of the judges.
b. Aside from the organizer no committee member may be a judge to the competition.
c. One of the judges must be Prof Chris Pistorius, the other two judges must be decided on by the organizing committee, noting that at least one judge must be non-academic.
d. Criteria for judging the posters will be:
   i. Content (appropriateness for the school) – 10%
   ii. Overall impact (i.e. appeal of the posters) – 10%
   iii. Clarity and brevity – 10%
   iv. Organization and layout – 10%
   v. Technical approach, results and conclusion – 20%
   vi. Response to questions (all three judges must ask at least one question to each participant) – 20%
   vii. Originality and innovation – 10%
   viii. Potential for work to be extended during a visit to CMU, resulting in a paper to be submitted for publication in the Journal of the SAIMM – 10%.
e. The decision by the judges is final, no appeal will be allowed.

PRIZES

a. There will be only one winner, no shared prize.
b. The prize will be an overseas trip to work with Prof. Pistorius at CMU in Pittsburgh for one week. Included in the prize money will be all costs for travelling and sustenance including accommodation.
c. The prize must be taken up within one year of the competition. Failure to do so would result in the SAIMM to be refunded the prize money to be handed to the runner-up.
d. On return from CMU, the winner must submit a paper (in collaboration with Prof. Pistorius) on the clean steel related work (partially) conducted at CMU. The paper must be submitted to the Journal of the SAIMM for consideration for publication within 3 months of the visit to CMU. Failure to do so would result in the SAIMM to be refunded the prize money to be handed to the runner-up.