



envoy

The achieva

DECEMBER 2004

The **achieva** Recipe for Service

Preheat the inspiration to 230 deg.C. Fill the pan full of equal amounts of energy and passion and leave to boil carefully. Handpick and wash the team and rub in the seasoned training, making sure not to damage the hearts. Place in an ovenproof dish and pour over the sweet juices of service and flair. Top up the juices with a good bottle of attitude. When all the ingredients are in perfect synergy, serve with a few slices of simplicity and drizzle over the competitiveness. Finish with a fine glass of friendliness and ambience and enjoy.

On behalf of all IAS staff, we would like to wish you and your families an enjoyable Christmas filled with love and peace.

INSIDE :

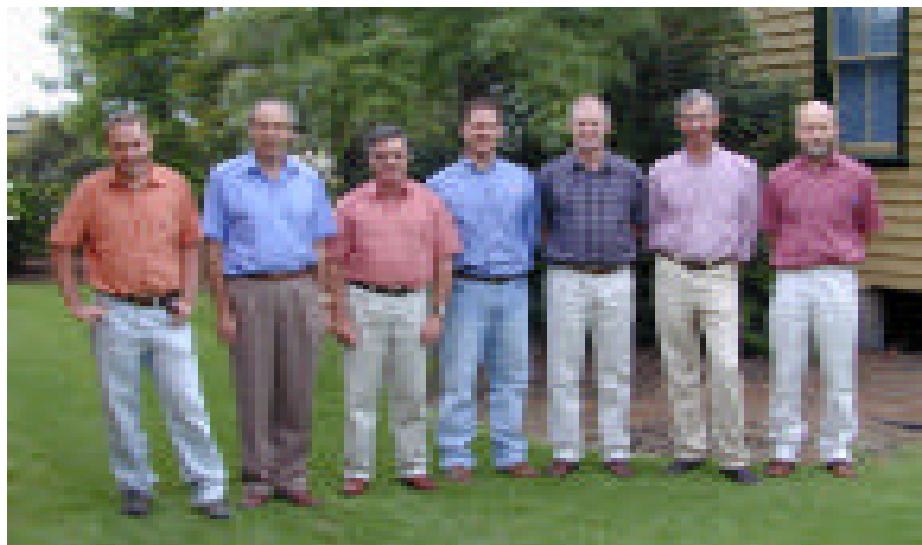
- *The Birth of achieva Hot Strip Mill Setup Model*
- *The World's Leading Flat Rolling Course*
- *achieva Coating Mass Control*

THE BIRTH OF **achieva** HOT STRIP MILL SETUP MODEL

A NEW ARENA FOR IAS - This year has seen us commission two steel hot strip finishing mill setup models; one at Panzhihua in China and the other in Australia at the Western Port plant of BlueScope Steel.

The Chinese project arose from an earlier project where IAS provided

their **achieva SETUP SYSTEM** for the Panzhihua 6-high, 4-stand cold mill. Supply of the 6-stand hot mill model involved working in collaboration with ARIM in Beijing and IPSS from Virginia who supplied their model as the basis of this system.



The IAS Hot Mill Team

THE BIRTH OF
achieva
 HOT STRIP MILL
 SETUP MODEL
 (cont'd)

IAS added key components such as rollgap models for predicting force, torque and slip and advanced yield stress models previously developed for use in offline simulation studies. The Panzihua mill started shadowing in April 2004 and went on-line in June. Guarantees were met in August which involved improving the percentage of coils with the head end thickness within tolerance from approximately 48% to 92% of coils. The accuracy of stand repredicted forces improved from approximately 60% to 95%, with errors less than 6%. This result was a significant achievement and reflected well on the excellent cooperation between IPSS and IAS.

The second project at the Western Port hot mill involved a completely new setup model developed in-house by IAS and BlueScope Steel. The mill was commissioned in 1978 with Mesta mechanical equipment and General Electric drives and automation. In-house enhancements were made in the following three years and the system then remained largely unchanged.

The hot mill automation computer hardware and dynamic controls had been upgraded relatively recently, however, the setup model was transferred without modification so it was significantly out of date and in need of replacement. When the setup model upgrade project was being instigated, the steel industry was in poor shape financially and capital investment for discretionary projects was hard to find. Consequently, BlueScope and IAS decided to initiate a staged project.

Stage one developed a detailed functional specification. This incorporated new ideas and models from several sources and was based on the highly successful cold mill technology **achieva SETUP SYSTEM**. Subsequent stages involved developing the software and commissioning the new model, after an

extended period of shadowing to verify its accuracy.

Functional specification meetings were held at our Teralba office and were attended by Western Port plant technical experts and by R&D personnel from the renowned BlueScope Steel rolling technology group managed by Dr Daniel Yuen and based in Port Kembla.

The plan was to review all the models available from the three sources and to select the best possible combination. This was achieved in an interesting series of discussions. The resulting specification was considered to represent the state-of-the-art as far as advanced rolling mill setup prediction models was concerned.

Particular areas where novelty was introduced compared to conventional models were:

- ▶ Yield stress model based on earlier BHP torsion testing research, including retained strain components.
- ▶ A friction model which takes into account roll materials, roll wear, strip temperature, oil lubrication effects and strip speed.
- ▶ A fundamental rolling theory based on Orowan's classical equations and including the effects of sticking, slipping, elastic compression and recovery and roll flattening.
- ▶ An energy based torque model, extended to include sticking shear effects.
- ▶ Detailed "through thickness" temperature model for the strip centreline and also the strip edges with specially developed models for the descale spray cooling effect and the entry heat shield.
- ▶ Scale layer thickness prediction model including phase change effects.

- ▶ A 3-D model of the coilbox enables temperature along the coil length and across the width to be estimated.
- ▶ Innovative adaptive thread algorithm with disturbance estimation and filtering.
- ▶ Axisymmetric thermal camber and wear models for use in flatness and profile prediction.
- ▶ Detailed finite difference roll stack deflection model.
- ▶ Comprehensive model adaption on both the headend and body sections of the coil, including neural network components for the residual errors in head end thickness, temperature and strip width.
- ▶ All previously proven cold mill features such as mode dependent model coefficients, comprehensive diagnostic facilities, engineering log analysis and instrument reliability checking.

The software development was a joint effort between IAS and BlueScope staff with the latter modifying data scanning and collection techniques and interfacing to the existing Level 2 Toshiba architecture.

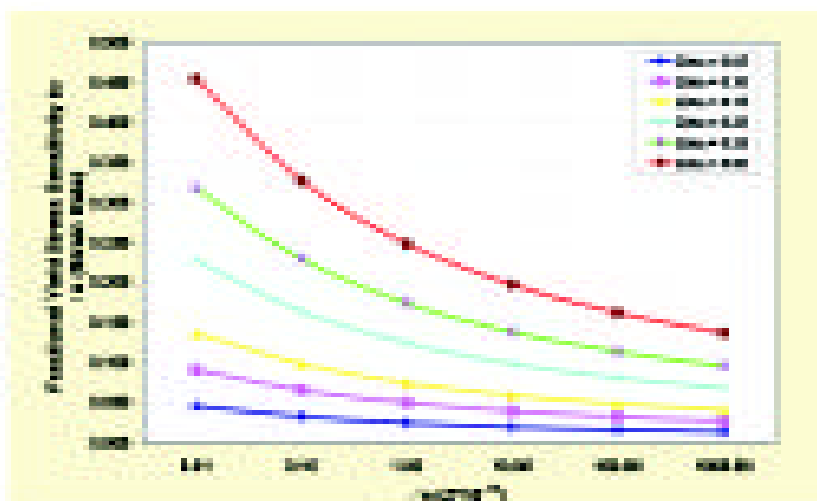
The **achieve SETUP SYSTEM** was written in C++ and implemented on PCs

using standard software development packages.

Shadowing commenced in April 2004, the model went on-line in June and was handed over in October having achieved its short term targets. The key objective is to reduce “hold” coils and this will be evaluated over a longer timeframe of twelve months for the final performance evaluation. The initial result after 10,000 coils is that “hold” coils have been reduced by approximately 40%.

Apart from the performance improvement, the new system provides a much enhanced maintenance environment with several invaluable new tools and new information now available. For example, the new yield stress model has a convenient user interface, which allows the key characteristics of the yield stress and retained strain behaviour to be defined, and an algorithm then calculates the model coefficients automatically. This is a significant improvement over the previous form of model, which had complex coefficient interactions and redundant coefficients.

The example in the Graph shows how the yield stress sensitivity to strain rate for different values of the Zener-Hollomon parameter can be defined by the single model input parameter zeta.



The experience gained in this project has led to several further design insights, which are currently being implemented for testing early in the new year.

We would like to acknowledge the tremendous cooperation received from Western Port plant and Steel Research personnel in all phases of this project.



THE WORLD'S LEADING FLAT ROLLING COURSE:

The 24th International Rolling Technology Course (IRTC) Vancouver, achieved a major milestone in 2004; its 1000th graduate. The prize went to Paul Hotson of Dofasco Canada, who won a 12 month licence for APT (Advanced Personal Trainer computer-based training package).

Graduates who attend this industry-recognised course continue to sing it's praises. *"World class results require world class knowledge – IRTC provides that"*. **David Vittetoe, ISG Indiana Harbor USA**

Delegates comment that they enjoy the hands-on simulation and discussion sessions, providing them with an opportunity to expand their knowledge by sharing their own mill problems and experiences with colleagues and lecturers.

From 2005 the IRTC rolling mill simulation programs will be made available to delegates on-line for 6 months following the course, in order that they can continue the IRTC experience.

In recent times the course is being used to fast track bright new engineers along the learning curve as more experienced employees within the metals industry are moving on in their careers. The course objective, however, remains to enable delegates with all levels of experience to solve problems specific to their area of interest by providing a firm understanding of the major concepts and characteristics of flat rolling.

IRTC 25 will be held in late April 2005 in Athens Greece.



In recent issues of Envoy you might recall quite a number of articles about our **achieva COATING CONTROL**. This is for good reason.

As we go to press we have just received our sixth order for 2004, no mean feat for a product we always believed could achieve success in the market place. In a sense, the **achieva COATING CONTROL**, in its former guise of COMAC, was a late bloomer, but for those of you who have an early IAS Coating Control System, then I guess we should congratulate you for your foresight.

This year we have taken orders for

three hot dip galvanizing lines in the USA and two in Mexico. The latter include the control of the DAK (Dynamic Air Knife). This has required some modification of our control strategy to utilise the additional actuators present within the air knife itself.

Recently a large number of enquiries have been received from our customers for **achieva COATING CONTROL**.

It appears that the combination of world leading performance (zinc savings) and competitive pricing, make **achieva COATING CONTROL** the system of choice and one that will ensure the best "bang for the buck".



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