A New Rolling Course for the Aluminium Industry

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Producing aluminium flat products to the standards required by today's markets needs a thorough knowledge of the rolling process and the principles of gauge and flatness control. Innoval Technology have created a special course for producers of aluminium sheet and foil to satisfy this need. The "Aluminium Rolling Technology Course" is designed to help the participants reduce downtime and improve product quality through faster diagnosis and solution of rolling problems by their own engineers. It also provides suppliers to the rolling industry with an insight into the application of their equipment.

The course has been produced following years of experience within the aluminium industry. Innoval technical experts, who present the course, have gained most of their experience within the former Alcan rolling plants throughout the world. It is believed that this is the only course designed specifically for the producers of aluminium flat products.

The course consists of technical presentations and workshop sessions in which course members carry out exercises to ensure they have understood the concepts. Some of the workshop sessions involve running computer simulations. The participants leave with an 800 page colour manual summarising the presentations. This consists of the slides used by the presenters accompanied by detailed notes on their contents. Previous participants have said that they use the manual on a regular basis after the course!

In order to allow a maximum level of interaction between presenters and participants the number on the course is restricted to ten. There is also a schedule of extra mural activities which is greatly enjoyed by the course members and helps develop friendships which allow future networking.

Comments on previous courses:

It was an excellent course, very well organised and carefully structured to cover accurately the wide field of aluminium rolling.

Alexandros Mountis, Siemens VAI

I found it very useful indeed. The course gave me a very good overview of all the elements associated with the process including both Electrical and Mechanical conditions.

Marc Jones, Dolgarrog Aluminium

The timetable for November 2006 is shown below:

ALUMINIUM ROLLING TECHNOLOGY COURSE - Innoval Technology, Banbury 13-17th November 2006

v1

	MONDAY 13	TUESDAY 14	WEDNESDAY 15	THURSDAY 16	FRIDAY 17
09:00	Introduction	Thermal Aspects of Rollng	COURSE VISIT (JAGUAR)	Vibration	Flatness Mechanics & Control
09:15					
09:30	The Business of Rolling				
09:45					
10:00				Condition monitoring	Flatness Control Workshop
10:15					
10:30	COFFEE				
10:45		COFFEE		COFFEE	COFFEE
11:00	Mechanics of Rolling	Thermal Aspects Workshop		Gauge Control	Flatness Mechanics & Control
11:15					
11:30					
11:45					
12:00	Mechanics of Rolling Workshop	Spray Cooling Case Study			
12:15					
12:30					Wrap up Session
12:45					
13:00	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
13:15					
13:30		TOUR OF INNOVAL			
13:45	Machinery of Rolling		Control Systems	Profile Mechanics & Control	
14:00		Lubrication			
14:15					
14:30					
14:45		Lubrication discussion			
15:00					
15:15	COFFEE	COFFEE	COFFEE	COFFEE	
15:30	Process Metallurgy	Surface Generation	Control Systems	Profile Control	
15:45					
16:00					
16:15					
16:30	Process Metallurgy Workshop	Surfaces Discussion			
16:45			Rolling Process Models		
17:00		Wrap up Session		Wrap up Session	
17:15					
17:30	Wrap up Session				
17:45					
	Free	**Social Event**	**Free**	**Social Event**	

More details of the contents of each session are given below:

The Business of Rolling:

In this session, the course is introduced and is put into the context of the global rolling business. We describe the economic aspects of rolling including the effect of business cycles and looking to future trends in the aluminium industry

Mechanics of Rolling

This session covers metal yield criteria (Von Mises and Tresca), the basic roll gap theory with application to the calculation of rolling load via the friction hill. Closed gap rolling is included.

Machinery of Rolling

Here all the main items of machinery involved in the rolling process are reviewed. This includes the major components of the rolling mills – housing, bearings, drives etc. Entry and exit equipment is included.

Process Metallurgy

The essential features of aluminium microstructure are described together with common strengthening mechanisms. The processes of annealing are described. The workshop exercise challenges the course participant to find a process route for a given alloy which will simultaneously achieve the requisite strength and elongation.

Thermal Aspects of Rolling

Here the way temperature distributions develop in the rolls is described and how these affect rolled strip profile and flatness. The way the distributions can be used to control flatness and profile via roll cooling spray design is discussed.

Roll Spray Cooling case study

In this session several cases requiring the re-design of the roll spray cooling system are described. The methodology of producing improved spray cooling arrangements is demonstrated with examples.

Lubrication

The basics of friction and lubrication in both hot and cold rolling are considered in this session. The mechanisms for protecting the metal surfaces during boundary lubrication are described and the choice of additives discussed. Lubricant filtration and circulation systems are shown.

Surface Generation

One of the most important attributes of aluminium sheet is the surface generated by rolling. All the main issues relating to surface defects during rolling are described, e.g. lubricant entrapment, scuffing and reduction marks. The generation of bright surfaces is included.

Control Systems

Open and closed loop control systems are described and in this very interactive session the participant learns how to tune a simple PID system using the computer-based simulator.

Gauge Control

The general control session is then extended to apply to the control of gauge in mills. The issue of controlling the gauge anywhere on the strip is described together with the various gauge measuring devices.

Rolling Process Models

In this session basic models of the process through ingot pre-heating, rolling and coil annealing are demonstrated. The various roll gap models developed during the 20th century are described showing their assumptions and limitations. In this talk the characteristic of the closed gap roll gap are discussed in detail in the context of modelling.

Mill vibration

The main types of mill vibration - 3rd and 5th octave chatter are outlined. An FE model of the mill is used to show the principle modes of vibration and the issue of self-excitation. An approach to solving vibration problems is discussed.

Condition monitoring

This session is included to reflect its growing importance in relation to mill maintenance. Aspects of condition monitoring described include vibration measurement, thermography, oil analysis and the use of ultrasound to assess the condition of equipment before failure occurs.

Profile mechanics and control

Profile development during rolling is described, drawing on the basic work covered in earlier sessions. Methods of measuring across-width strip profile are illustrated and how these may be used in closed loop to control profile. This extends from simple "punched disc" methods to the use of multi-head isotope and X-ray gauges. The effects of poor profile on downstream processes – e.g. coiling are described.

Flatness mechanics and control

Methods of measuring flatness during cold rolling are described and how the measurement may be used to control flatness. The various actuators – tilt, bending and cooling are evaluated and it is shown how they may be incorporated into an effective control system. Examples of how to solve common flatness problems are given.

The Manual