Belt Analyst™ Standard Curriculum

DAY 1	DAY 2	DAY 3
New User Training (Part 1)	**New User Training (Part 2)**	**Advanced Training**
Open to all · Belt Analyst™	Belt Analyst™ (continued)	Dynamic Analyst™

New User Training (Part 1)

Day 1 · Open to all, including but not limited to new Belt Analyst™ users

ABOUT THIS SECTION

A review of the current state-of-the-art in engineering analysis and simulation tools used in the design of belt conveyors.

WHO SHOULD ATTEND

→ Anyone who designs short, long, and/or high capacity belt conveyors

→ Anyone responsible for operation, maintenance, or servicing of belt conveyors who need a working understanding of conveyor design and performance

→ Anyone considering the purchase of belt conveyor design software

→ All new users of the Belt Analyst™ suite

#	TOPIC · SUBTOPICS
01	**General Computer Aided Engineering (CAE) Methods & Techniques** CAE tools are used for general system design, to analyze and select components, and to evaluate the robustness and performance of components. These tools include analysis, simulation, validation, and optimization of products and support design teams in decision making.
02	**Static & Steady State Belt Conveyor Analysis — Belt Analyst™** This basic system design tool is the primary building block of the belt conveyor design and engineering process. From the primary calculation of demand power to stress analysis, safety factors and life of individual components, everything begins with the steady state running condition.
03	**Dynamic Belt Conveyor Analysis — Dynamic Analyst™** The most difficult part of the belt conveyor engineering process is determining the safest method of stopping and starting. These “change of state” conditions will ultimately determine the overall reliability and cost effectiveness of the entire system.
04	**Optimization of the Conveyance Route — Horizontal Curve Analyst™** As conveying distances get longer (up to and beyond 100 km), determining the best route is significant to the success of every project. By utilizing the above tools in a controlled and organized optimization process, the best option will generally become easy to select.
05	**Non-Conventional Belt Conveyors — Pipe Analyst™** In addition to conventional belt conveyors, we will review various non-conventional methods of moving bulk materials by rubber belt. The most popular of these is the Pipe Conveyor.
06	**Bulk Material Flow Simulation — Bulk Flow Analyst™** Perhaps the most significant step in the entire process is the design and simulation of the material transfer onto and from a belt conveyor. Controlling the flow of bulk materials prevents noise, dust, spillage and blockage. Use of the Discrete Element Method (DEM) is the only viable technology available to ensure a safe, reliable design.

ABOUT THIS SECTION

Basic engineering principles for designing any belt conveyor, with hands-on Belt Analyst™ training. Approximately 25% mechanics and 75% critical thinking — equipping attendees to interpret results and understand the design process.

WHO SHOULD ATTEND

→ All new users of the Belt Analyst™ application and those interested in using it

→ Anyone responsible for the operation, maintenance, or servicing of belt conveyors who need a working understanding of the component-level and system performance knowledge that directly informs maintenance decisions and operational limits

→ Mining & Engineering students

#	TOPIC · SUBTOPICS
	DAY 1 · New User Training (Part 1) — Belt Analyst™ Software Topics
01	**Engineering Basics** TERMINOLOGY ▪ Arrangement ▪ Basic Paths ▪ Directional ▪ Conveyors in Series ▪ Cross Section STANDARDS & TENSION ▪ Building a Tension Diagram ▪ DIN (German) ▪ CEMA (North America)
01a	**BA Interface** ▪ Software Overview & Navigation ▪ Input / Output Panels ▪ File Management & Project Setup
02	**Material Characteristics – Behavior of Materials on a Moving Belt** ▪ Density ▪ Repose / Surcharge ▪ Inclines & Declines
03	**Width / Speed / Capacity** ▪ Belt Width vs. Lump Size ▪ Belt Speed ▪ Cross-Sectional Area (CEMA vs. DIN) ▪ % Loaded ▪ Edge Distance ▪ Material Weight / Length ▪ Putting it all together
03a	**Flights** ▪ Inputting / Manipulating ▪ Importing from AutoCAD & External Sources
04	**Idlers** FUNCTION & TYPES COMPONENTS ▪ No. of Rolls ▪ Troughing Angle ▪ Frame Type ▪ Bearing Type ▪ Load Rating / L10 Life ▪ Seal Type SELECTION ▪ Load ▪ Life ▪ Rim Drag (Resistance to Motion) INSTALLATION

05

Power Calculations

DIN / CEMA UNIVERSAL

- Idler Rim Drag
- Idler Alignment
- Material Flexure (Trampling)
- Bearing / Seal / Temperature

RUBBER INDENTATION

- Rubber Grade
- Rubber Gauge
- Belt Speed
- Idler Roll Diameter
- Temperature

06

Drives

DRIVE DEFINITION/COMPONENTS

PURPOSE & AC MOTORS

- Required Power
- Regeneration
- Speed Torque Curve
- Starting vs. Breakaway Torque

DRIVE TYPES

- No Control (ATL)
- AC Reduced Voltage
- Fixed Fill Fluid Coupling
- VFD
- Wound Rotor
- Variable Fill Fluid Coupling
- DC Motor
- Hydro-viscous Clutch

BRAKES, BACKSTOPS & CONFIGURATION

- Types: Spring Set vs. Velocity controlled
- Backstops: Rating vs. Torque
- Configuration Options: Single & Multiple Drive Pulleys
- Load Sharing
- Head / Tail Drives
- Intermediate Drives

07

Take-up

TYPES

- Gravity
- Mechanical
- Fixed

DESIGN CRITERIA & CONDITIONS

- Drive Slip
- Belt Sag
- Running
- Starting
- Stopping

TRAVEL

- Permanent
- Elastic
- Adding Sheaves
- Mechanical Losses

New User Training (Part 2)

Day 2 · New Belt Analyst™ users

ABOUT THIS SECTION

Continuation of New User Training. Topics build on Day 1 content — covering advanced belt, pulley, and drive analysis through dynamic introduction.

WHO SHOULD ATTEND

→ All New User Training (Part 1) attendees continuing their Belt Analyst™ training

07a

Accurate / Advanced Flight and Pulley Inputs

FLIGHT SETUP
- Accurate Setup on Carry and Return

ADVANCED PULLEY SELECTION
- Drag and Drop Pulley Positioning
- Database: Locking Devices & Bearing Types
- Safety Factors & Bearing L10 Life

08

Belts

CONSTRUCTION
- Carcass: Fabric / Steel
- Covers: Grade / Gauge

SELECTION
- Strength / Rating (Running / Transient)
- Max & Min Belt Width
- Safety Factors

3D STRESSES
- Longitudinal (Tension Diagram)
- Transverse: Transitions / Vertical Curves / Turnovers
- Vertical: Pulleys / Face Pressure

09

Vertical Curves

CONCAVE
- Belt Stresses & Liftoff

CONVEX
- Belt Stresses & Idler Loads

10

Pulleys

RESULTANT LOADS
- T1 and T2
- Wrap Angle
- Tension Multipliers

MANUFACTURER REQUIREMENTS
- Diameter
- Face Width
- Bearing Centers
- Lagging
- Overhung Load
- Backstop

SHAFT / BEARING CALCULATIONS
- Shaft Deflection
- Shaft Safety Factor
- Bearing L10 Life
- Fatigue Life

11

Introduction to Dynamic Analysis

- Static vs. Dynamic
- When Is It Needed?
- Stopping and Starting a Belt Dynamically

Advanced Training — Dynamic & Data Driven Analysis

Day 3 · New Belt Analyst™ User Course Attendees Only

ABOUT THIS SECTION

Advanced engineering principles for long-distance belt conveyor design, with hands-on Dynamic Analyst™ training. Covers FEA, complex start/stop scenarios, power optimization, and multi-drive configurations applied to real-world example conveyors.

WHO SHOULD ATTEND

→ All Belt Analyst™ / Dynamic Analyst™ users who have completed New User Training.

→ Experienced Belt Analyst™ users new to or interested in Dynamic Analyst™.

→ Anyone responsible for the operation, maintenance, or servicing of belt conveyors seeking a deeper understanding of conveyor starting and stopping behavior – important conditions that affect reliability and often require intervention

#	TOPIC · SUBTOPICS
01	**Introduction — Example Conveyors** ▪ High Incline ▪ Long Flat with Horizontal Curves ▪ Decline & Incline Combinations ▪ High Capacity
02	**Review of Advanced Design Practices** ▪ Recap of advanced methodologies from prior courses
03	**Dynamic Analysis** FEA FUNDAMENTALS ▪ Finite Element Analysis ▪ Tuning / Damping / Time Steps ▪ PID Control Logic TAKE-UP CHARACTERIZATION ▪ Gravity: Vertical & Horizontal Carriage ▪ Mechanical: Winch & Hydraulic STOPPING ▪ Power Out ▪ Powered (Velocity Ramp) ▪ Mechanical Brakes ▪ Holdbacks STARTING ▪ Velocity Feedback ▪ Fluid Couplings ▪ Wound Rotor ▪ DOL / Reduced Voltage ▪ Aborted Start
04	**Data Driven Analysis** ▪ Operational Data Needs ▪ Loading & Calibrating Data ▪ Using The Results to Make Data-Driven Decisions
05	**Advanced Power Calculations** ▪ Power Optimization ▪ Idler & Rubber Selection ▪ Effect of Installation ▪ Loading / Overloading ▪ Temperature Effects
06	**Drive Configurations** ▪ Locating Drives ▪ Multiple Drives — Single Location ▪ Head / Tail Drives

- Intermediate Drives

07

Horizontal Curves

- Analysis of horizontal curve design in long-distance conveyor applications

07a

Feeders

- Types
- Calculate Power

08

Workshop — Work Through Each Example Conveyor

- High Incline
- Long Flat with Horizontal Curves
- Decline & Incline Combinations
- High Capacity