**METSIM® FEATURES**

**Complete Project Simulation in Five Modes**
- Material Balance calculates consistent mass balances from measured plant data.
- Parameterization back calculates equipment parameters from actual operations.
- Steady State Simulation predicts mass and energy balances for alternative cases.
- Equipment Design sizes equipment based upon design criteria and mass balances.
- Dynamic Simulation calculates and plots time dependent process

**Flowsheet Features**
- Flowsheet and Dynamic Graphics
- Handles Very Large Flowsheets
- May Run Portions of Flowsheets
- Robust Flowsheet Convergence
- Easy to Add New Unit Operations
- Unlimited Number of Streams

**Chemistry Features**
Online Thermodynamic Database
Chemical Kinetics and Phase Equilibrium
Eight Solid, Liquid, Molten, Gas Phases

**Process Controller Features**
Feedback and PID Controllers
Logic/Expert System Controllers
Equations may be Entered by User

**Budgeting**
Operating Costs
Mining Costs (Opcost)

**Full Graphical Interface**
Truly Interactive Program and Menus
Easy to Learn, Get Immediate Results

**Compatibility Features**
Spreadsheet Interface to Excel
DDE interface to Excel, InTouch
DXF interface to AutoCAD

**Low Cost, One-Time License Fee**
Updates and Support Also Available for a Low Annual Fee
METSIM® is the premier process modeling software, capable of accurately simulating a wide variety of processes for inorganic chemicals, hydrometallurgy, pyrometallurgy, alternative energy and environmentally sensitive processes. Process designers benefit greatly from using the many tools that Metsim possesses. Over 500 companies and universities in 48 countries are using Metsim for the design, simulation, and operation of complex heap leaching systems, metallurgical plants, tailings ponds, fertilizer plants, etc. The long list continues to grow daily.

Metsim has the following modules: Base, Mine, Commination, Heat Balance, Dynamic Simulation, Contouring, Costing, and Engineering. An Iron and Steel Module is under development.

The **Base Module** includes chemical, beneficiation and hydrometallurgical unit operations to simulate flotation, leaching, solid/liquid separation, solvent extraction, electrowinning, and numerous other equipment such as tanks, pumps, bins, stockpiles, etc.

The **Commination Module** includes unit operations for crushing, screening, grinding, classification, gravity separation, dense media, and coal preparation. This module is used when liberation and particle size analyses are critical in the process.

The **Heat Balance Module** includes models for autoclaves, dryers, kilns, furnaces, boilers, and steam and gas handling equipment. An interface to FactSage is available to access Fact’s extensive databases for slags, mattes, and alloys.

The **Dynamic Simulation Module** focuses on time dependent models such as heap leaching, solar energy/weather effects, and tailings ponds or processes where there is a large variation in feeds.

The **Contouring Module** is used for building complex heap leach and tailings facility models from DXF contour files and for displaying data graphically.

The **Mine Module** allows import of drill-hole data, the mine block model and the mining sequence. The feed to the waste dumps, heaps, stockpiles and plant can then be taken directly from the mine. This allows dynamic simulation over the life of the mine. With Metsim’s new interface to Logikos’s Overview security and asset tracking system, real time simulation and control will become the new standard.

The **Engineering Module** allows any process engineer to easily perform preliminary design calculations, size equipment, generate equipment and instrumentation lists, simulate and test process control strategies, and build operator training interfaces.

The **Costing Module** calculates and reports plant operating costs. It also includes OPCOST, a capital and operating cost program for mining, which calculates manpower, fuel and supplies, and generates equipment purchase and replacement schedules. This module does not calculate plant capital cost.

**Features:**
- Fully graphical interface for building models and printing flowsheets
- Over 180 unit operations with more being added monthly
- DDE, Dynamic Data Exchange, for easy interfacing to Excel, InTouch, PID controllers, etc.
- DXF file input and output for interfacing to AutoCad and other graphic programs
- Option to display, on the flowsheet, variables such as temperature, pH, assays for rapid debugging

**CONSULTANCY** · Metsim’s Agents can add to your team’s capability through our consultancy services. As a group, we have the widest range of modelling skills and experience worldwide. Services range from simple assistance with setting up models to subcontracting complete model building and development.

**AUDITING** · How do you know you are getting value for money when using third parties or inhouse staff to develop models for you? We can audit models and check on their quality to insure they incorporate the latest Metsim tools and techniques available.

**PROJECT MANAGEMENT** · To insure maximum return on your investment, we can manage any or all aspects of model development. We can provide services in training, modelling, monitoring and auditing to insure best practice, efficiency and reliability.
## METSIM DEVELOPERS’ EXPERIENCE

<table>
<thead>
<tr>
<th>Process</th>
<th>Equipment</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alumina</td>
<td>Bayer</td>
<td>Ceralox, Alcan</td>
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<tr>
<td>Beryllium</td>
<td>Acid Leach</td>
<td>Brush Wellman</td>
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<tr>
<td>Borax</td>
<td>Beneficiation</td>
<td>U.S. Borax</td>
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<tr>
<td>Coal</td>
<td>Dense Media Plants</td>
<td>Grimethorpe U.K., Nemo U.S.</td>
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<td></td>
<td>Pyrolysis</td>
<td>RTZ Kennecott</td>
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<tr>
<td>Copper</td>
<td>Concentrator</td>
<td>Collahauisi, Chiquicamata, El Teniente, Hindustan</td>
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<tr>
<td></td>
<td>Heap Leaching</td>
<td>Asarco, Cerro Colorado, Cero Verde, Collahausi, Cyprus Miami, El Abra, Escondida, Freeport, Lomas Bayas, Vale 118, Michilla, Tyrone, Spence, Straits Resources, Penoles</td>
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<tr>
<td></td>
<td>Hydrometallurgy</td>
<td>CESL, Vale</td>
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<tr>
<td></td>
<td>Smelting</td>
<td>Boliden, BHP Magma, Cyprus Miami, Chuquicamata, Disputada, Kennecott, Nacosari, Outokumpu, Pasar, PD Hidalgo, SPCC, ZCCM</td>
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<tr>
<td>Copper</td>
<td>Heap Leaching</td>
<td>Cripple Creek, Herradura, Murantile, Neumont, Teberebie</td>
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<tr>
<td>Iron/Steel</td>
<td>Midrex, HYL, EAF</td>
<td>BOC, Inland, US Steel, Lockwood Greene</td>
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<td></td>
<td>Pelletizing</td>
<td>London Mining</td>
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<tr>
<td>Lead/Zinc</td>
<td>Hydrometallurgy</td>
<td>Cove McCoy, Homestake, Lihir, Mahd Adahb, Pan Continental, Sante Fe Pacific</td>
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<tr>
<td></td>
<td>Smelting</td>
<td>CEZ, Hudson Bay, Pasminco, Ruhr Zinc</td>
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<tr>
<td></td>
<td>RTZ Britania, Cominco, Elkem</td>
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<tr>
<td>Molybdenum</td>
<td>Concentrator</td>
<td>Anaconda Hall, Quartz Hill</td>
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<tr>
<td></td>
<td>FeCl3 Leach</td>
<td>3 Projects including Hall Moly</td>
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<tr>
<td>Nickel/Cobalt</td>
<td>Hydrometallurgy</td>
<td>RTZ Fortaleza, Koniambo, Goro, Vale Niquel Vermelho</td>
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<tr>
<td></td>
<td>Heap Leaching</td>
<td>European Nickel, Vale Piaui</td>
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<td></td>
<td>Ferronickel</td>
<td>Cerro Matoso, Falconbridge, PT Inco, Vale Onca Puma</td>
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<tr>
<td>Phosphoric Acid</td>
<td>Acid</td>
<td>W.R. Grace, Vale</td>
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<td>Potash</td>
<td>Solar Ponds</td>
<td>Amax Magnesium, Arab Potash, GSLMCC, SQM</td>
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<td>Beneficiation</td>
<td>Mississippi Potash, IMC Kalium, PCS, Intrepid, SQM</td>
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<td></td>
<td>In Situ Leaching</td>
<td>IMC</td>
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<tr>
<td>Rare Earths</td>
<td>Solvent Extraction</td>
<td>Agip, Molycorp (Y, La, Pr, Nd, Ce)</td>
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<td>Salt</td>
<td>Food, Industrial</td>
<td>Morton Salt, GSLMCC</td>
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<td>Soda Ash</td>
<td>Trona</td>
<td>FMC, Texas Gulf</td>
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<tr>
<td>Uranium/Vanadium</td>
<td>Acid and Carbonate Leaching</td>
<td>12 projects including Cotter, Exxon, Plateau Resources Homestake, Pan Continental, Rossing, United Nuclear, Strathmore, CFI, Bluewater, Meridian, Atlas</td>
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</tbody>
</table>
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METSIM is

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Current Site
Licenses In:
Australia & Asia

Ausenco Services Pty Ltd
Eight Mile Plains, Queensland

BHP Billiton Limited
Nickel West Stainless Materials

Gold Fields Limited
South Africa

Goro Nickel Operations
Nouvelle Caledonie

Guangzhou Greenener Chemical Technology Co., Ltd
Guangzhou, China

Hatch Associates
Spring Hill, Queensland

Hatch Associates
Perth, Western Australia

Henrietta Notz
Perth, Western Australia

Intec Ltd

Ivanhoe Australia Ltd

Jacobs E&C Australia Pty Ltd
Perth, Western Australia

Jacobs E&C Australia Pty Ltd
Brisbane, Queensland

JGC Corporation

China Jinchuan Nickel & Cobalt Engineering Institute,
Jinchang, Gansu Province, China.

Koniambo Nickel SAS
New Caledonia

Lycopodium Minerals Pty Ltd

Lynas Corporation Ltd
Pahang, Malaysia

Meteng Pty Ltd

Minara Resources Limited

Newcrest Mining Limited
Lihir Gold mine

Norilsk Process Technology

North East University
HePing District., China

Proteus Engineers Pty Ltd

PT ANTAM (Persero) Tbk.
Jakarta, Indonesia

PT ANTAM (Persero) Tbk.
Pomalaa, Indonesia

PT Kasongan Bumi Kencana
Jakarta, Indonesia

Rio Tinto Technical Services

Sargan Engineering

Sedgman Limited

Simulus Pty Ltd

SNC Lavalin Australia Pty Ltd

SNNC
Gwangyang-Si Jeonnam, Korea.

Strategic Metallurgy Pty Ltd

Sumitomo Metal Mining Co. Ltd
Nihama Research Laboratories, Japan.

Uranium Equities Limited

Vital Advanced Materials R&D
Guangzhou, China

WorleyParsons Services Pty Ltd
Adelaide, South Australia

WorleyParsons Services Pty Ltd
Melbourne, Victoria

Xstrata Zinc Lead Smelter

Zijin Mining Group Co., Ltd
Shanghang County, China

Institut Teknologi Bandung
Bandung, Indonesia

China University of Mining & Technology,
Xuzhou city, China

Chongqing University
College of Materials Science Engineering,
Chongqing China

Murdoch University
Murdoch, Western Australia

Central South University
Changsha, China

Institute of Process Engineering,
Chinese Academy of Sciences

North East University
HePing District., China

Boyd Willis Hydromet Consulting

Braemore Resources PLC

Changsha Engineering And Research Institute Of Nonferrous Metallurgy (CINF)

Changsha, China

China Nerin Engineering Co Ltd
Nanchang, China.

Core Process Engineering

CSIRO Division of Minerals

Dominion Gold Operations P/L
Challenger Gold Project

ENFI, Laterite Project Department
Beijing, 100038, China.

ERA, Ranger Uranium Mine

Elemental Engineering

Gindalbie Metals & AnSteel Group

Fluor Australia Pty Ltd
Melbourne, Victoria

Fluor Australia Pty Ltd
Perth, Western Australia

GE (China) Research and Development Center Co., Ltd.
Shanghai, China

Gladstone Nickel Project Pty Ltd

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