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**Commercialization of Projects
in the Metallurgical Industry**

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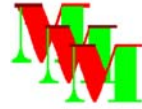
**A General Guide to the Steps Required for the Evaluation and
Implementation of New Technology**

by

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Introduction

Commercializing a process follows a fairly predictable path as outlined in the list below. As Edison said, "it is 99% perspiration, 1% inspiration." Evaluating 99% of the project comes down to confirming that all the necessary work has been done to confirm that not only the process works, but that it does so economically. The balance of the evaluation is more subjective -- evaluation of the team, their knowledge, experience and persistence.

It is great value to know what needs to be done to commercialize a process and to know where you are on that journey. From concept to completion of the first plant is typically a decade. You frequently have to convince investors that it will work before you have done enough work to prove it will work.

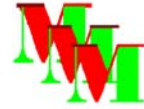
The probable result of this evaluation would be the following:

- 1) Identification of steps in their process (unit operations) that are unique and thus require development, optimization, and piloting (expensive).
- 2) Identification of the steps in their process that have been run commercially and thus require "only" engineering to implement.

In the first category above, a judgment must be made that the unique unit operation is based on sound theoretical knowledge and, hopefully, laboratory results.

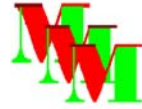
Evaluating the economics, based on the evaluation discussed above, is simply a matter of hard work. A material and energy balance defines all the inputs and outputs of the plant, which when coupled with costs and values, and a staffing plan, results in an estimate of revenues and operating costs. The net revenues have to be sufficient to provide a good return on the expected capital costs. At early stages in the project, order of magnitude capital costs are estimated by comparison to other projects of similar size and scope.

The preliminary due diligence will confirm that the process outlined above has been followed, or at least what has been done and what needs to be done. If much of the above has not been done, and it is my opinion that the process and project are viable, I will consider helping in the development process (its a big undertaking not to taken lightly). If much of the development process has been done and documented, then perhaps it is time to go to an engineering company. In short, the "due diligence" is all about answering the question, "what has been done (proven) and what remains to be done (proven)?"



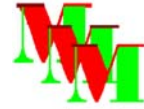
Technical Project Plan

- **Block Flow Diagram of the Process**
- **Process Flow Diagrams**
- **Definition of Unit Operations**
 - Description
 - Process Chemistry
 - Stage of Development
 - Thermodynamically Sound
 - Kinetics Proven
 - Successfully Piloted
 - Commercially Proven
- **Design Criteria**
 - Product List and Specs
 - Raw Material List and Analysis
 - Capacity Requirements
- **Material and Energy Balances**
- **Utility requirements**
 - Potable and process water,
 - Electric Supply
 - Sewer
 - Waste water treatment
 - Fuels
- **Equipment Lists, Sizing, Specifications**
- **Economics**
 - Operating Costs
 - Capital Costs
- **Environmental Concerns**
 - Key Pollutants
 - Regulatory Issues
 - Permits Required



Project Plan

- **Technical Development Plan**
 - Status of Unit Operations
 - Those Requiring Only Engineering
 - Those Requiring Piloting
 - Those Requiring R&D
 - Third Party Opinion and Evaluation
- **Project Schedule**
 - Key Milestones
 - Years to Cash Flow
- **Resources**
 - Management Team
 - Technical Team
 - Cash or Commitments
 - Partners
 - Patents
 - Engineering Firm
- **Project Profitability**
 - Project Cash Flow
 - Return on Investment
 - Synergy with Current Business Objectives
- **Business Plan**
 - Revenues, Costs, Profits
 - Cash Flow
 - Markets
 - Raw Materials
 - Supply Train
 - Management Team
 - Relationships with Partners
 - Contract Positions



Strengths of MV

Technical Project Plans

Material and Energy Balances

Operating Costs

Economic Modeling

Exclusive Ability: [Dynamic Financial Models](#)