A.H. BURNS ENERGY SYSTEMS LTD

ZINC OXIDE FROM SECONDARY ZINC

ENGINEERING SERVICES

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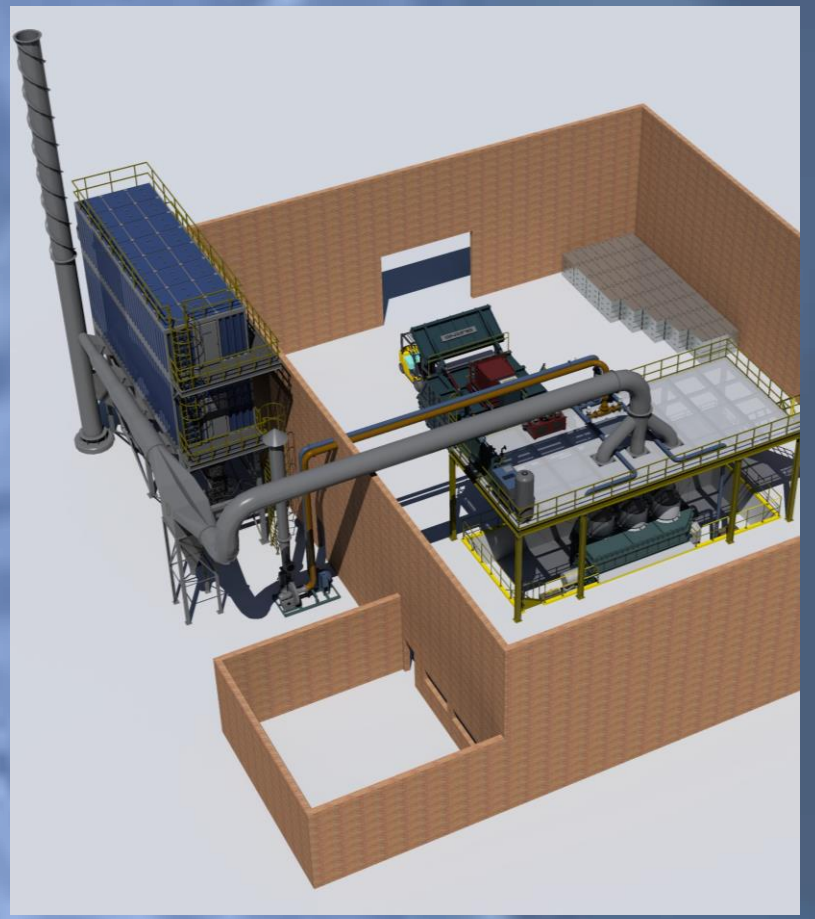
INTRODUCTION

- BURNS is primarily an equipment designer, manufacturer and supplier
- BURNS has identified a need for a specialist engineering company to assist with the design, construction and implementation of a modern zinc oxide plant
- BURNS is happy to offer the engineering services described in this PowerPoint

ENGINEERING SERVICES ON OFFER

- Feasibility
- Front End Engineering Design (FEED)
- Engineering, Procurement, Construction Management (EPCM)
- Engineering, Procurement, Construction Installation & Commissioning (EPCI)
- Training
- Consulting



FEASIBILITY

- Feasibility is a cursory evaluation of a project conducted with information provided by a client
- The intent is to quickly determine conditions for a “go/no-go” decision on a potential project
- A typical study for a zinc oxide plant requires 5 days on site and about 10 days to compile a report
- Ordering a feasibility study is a low cost way of getting started on a project
- The deliverable is a usually short report that is used as the basis of the *FEED*

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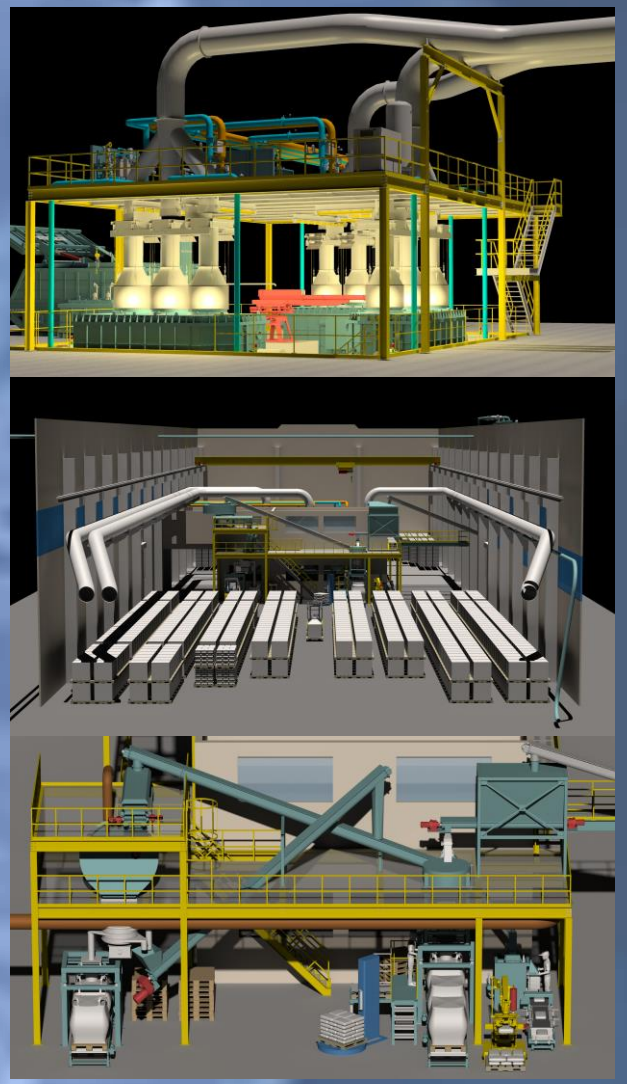
FRONT END ENGINEERING DESIGN (FEED)

- This is the preliminary engineering contract and is the start of the engineering process
- The *Deliverables* are usually
  - A report
    - Including an opinion for a “go/no-go” decision
  - Preliminary plant design
  - Mass Energy Balance
  - Equipment specifications
  - Control system; Description/Specification
  - Preliminary Budget and Schedule



FEED

- The crucial information presented is a proposed plant layout, a budget for the preliminary layout and a schedule estimate

- At the end of the FEED stage, budget and schedule accuracy are considered *FEL-2*
  - Project engineering is about 30% complete
  - FEL-2 *Accuracy* is -10% / + 15% unless otherwise agreed between the parties

FEED CONTINUED

- The object of the FEED process is:
  - To obtain the estimates, the plant mass-energy balance will have been developed
  - Major suppliers will have been asked and will have submitted proposals based on the worst case schedule
  - Installation estimates are factored from the supplier estimates
  - Foundations and building estimates will be factored from similar previous projects

ENGINEERING PROCUREMENT CONSTRUCTION MANAGEMENT (EPCM)

- *EPCM* is usually used to fast track a project
- *Deliverables* include
  - Engineering materials
  - Procurement materials
  - Construction management task report
- The EPCM contractor manages the project on behalf of the client. The client deals directly with the subcontractors with the assistance of the EPCM contractor

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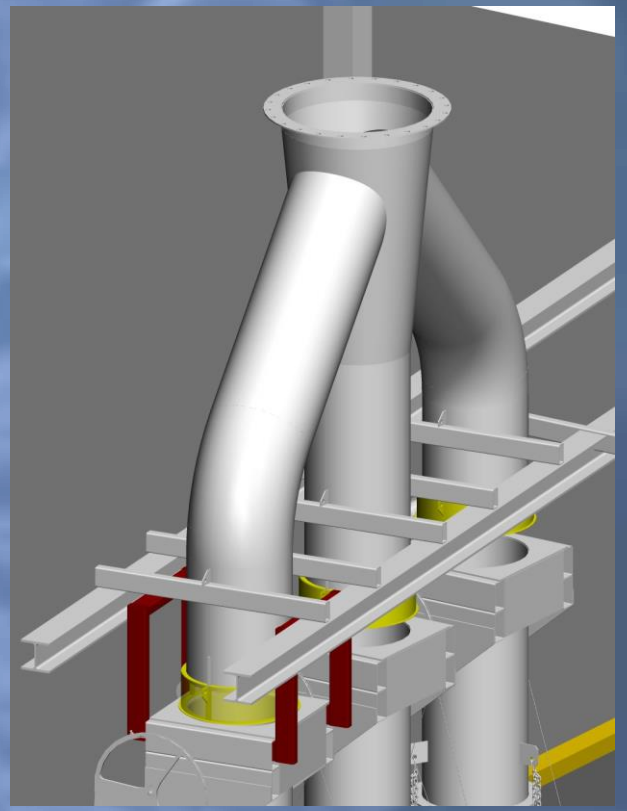
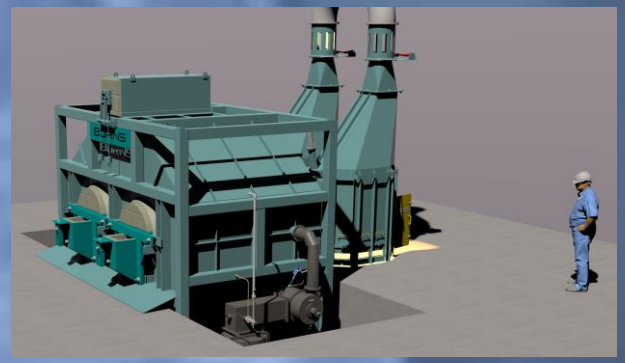
EPCM CONTINUED

- There is no cost certainty with this type of project as the construction phase of the project starts before the engineering work is 100% complete
- The EPCM contractor operates as an engineering consultant and engineering adviser for the project
- It is the job of the EPCM contractor augment the capabilities of the clients' engineering department



EPCM CONTINUED

- Advantages
  - Completion of the plant detailed design is not a requirement for starting project construction, meaning the project may be fast tracked
  - An EPCM contract is usually a low cost way to deliver a project as the client deals directly with the subcontractors
  - The client is able to choose and negotiate prices, within the engineering scopes, under the supervision of the EPCM contractor



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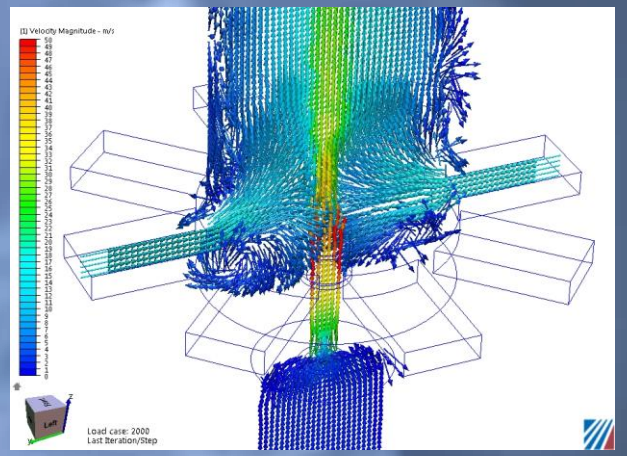
EPCM CONTINUED

- Disadvantages
  - The responsibility for delivering the project is shared
  - There is no on time / on budget performance guarantee
  - The engineering contractor will not normally carry specific insurance for this type of contract
  - Projects are not delivered turn-key



ENGINEERING PROCUREMENT INSTALLATION & COMMISSIONING (EPIC)

- This is really an EPC contract, with the installation, commissioning and oversight tasks added to the engineering contractor's scope
- When the plant is complete, the engineering contractor delivers operational and maintenance training
- In this type of contract the engineering contractor delivers the plant to the client, with little or no input from the client

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EPIC CONTINUED

- Advantages
  - Construction for a fixed cost project can only start after the detailed engineering design is complete and approved by the client
  - The equipment and installation scopes will have been issued and evaluated
  - Specific insurance is usually required for this type of contract quoted as an add-on cost during the FEED process
  - Making changes after engineering completion is potentially very costly in time and money
  - If a project is insured, use of used, refurbished or repurposed equipment is not allowed

EPIC CONTINUED

- Disadvantages
  - Once the project engineering documents have been approved modification requests become very costly to make changes
  - The client has very little control over the selection of sub-suppliers to the project
  - It is very difficult/costly to add upgrades or change the specification of a project, meaning that in some cases the project delivered is going to be of lower quality compared with a project delivered under EPCM conditions

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SUMMARY

- Commissioning a feasibility study is a low cost low risk way to start a project
- The FEED process is the required first step after acceptance of the feasibility study
- The FEED budget and schedule estimates will be *FEL-2* accurate and will provide sufficient information for informed “go/no-go” decision on the project

SUMMARY CONTINUED

- An EPCM contract has a number of advantages
  - Savings, as the client will be dealing directly with sub-contractors
  - Savings, due to shared technical risk
  - Project execution is quicker
  - Usually delivers a higher quality result
  - Project cash flow is under the control of the client
  - Project ownership is an intangible benefit. Local decision making and ideas are more easily incorporated into an EPCM project

SUMMARY CONTINUED

- An EPCI project
  - Is delivered at a fixed or a not to exceed price with penalties and incentives for performance
  - Is delivered *turn-key* to the client with little or no input from the client
  - Budget decisions are made by the EPCI contactor in accordance with the project terms
  - Is delivered on time with incentives and penalties for performance
  - Usually supplied with performance and financial guarantees

SUMMARY CONTINUED

- An EPCI contract requires full funding to be in place before the construction phase of the project is ordered, usually as a progressive draw guaranteed letter of credit or some other financial guarantee or instrument

- An EPCM contract can be progressively funded allowing for greater cash flow flexibility

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