INDUSTRIAL TURN-AROUND WBS

Planning and Scheduling Considerations

Planning and Scheduling Risk Analysis

By

Anthony (Tony) L. Lowery

1. Expectation date for turn-around to occur. [On occasions, the best planning by industrial operations can't foresee earlier shut downs due to problems. When this occurs, there might be a request to begin the shutdown work earlier than anticipated. However, many of the capital items will not be available, but some systems might be down to accomplish tie-in point installations that can improve the timelines for some capital equipment installations when the equipment becomes available during the scheduled turn-around.
    a. Shutdown
    b. Decontamination
    c. Date equipment can be opened and will be non-hazardous, and non-explosive (This is the date all major process work can begin.
2. BUDGET DEVELOPMENT
3. Preliminary meet:
    a. Meetings to determination scope of work, *begins several months before the planned shutdown begins; dependent on the complexity and scope it may require beginning the planning and scheduling many months earlier than depicted here. For ongoing turn-around relationships between owners and contractors and huge facilities, planning of the next turn-around may begin at the end of the last turn-around. Items of the last turn-around may be lag items from the last, especially where long-term delivery items are involved. (I.E. A glass lined reactor that may be a 20 month delivery)*
        i. Meeting about (**150days before turn-around**) 8 hours to maybe a 3 day meeting
            1. Detailed notes, Begin overall scope determination
                a. Safety: requirements
                    i. Training and certification
                    ii. Work permit, Line breaking, Hot Work, Tag and Lockout, Vessel Entry, Hard hat, Safety Glasses, Face Shields, Safety Shoes
                    iii. Emergency Alarm system and designated evacuation gathering/headcount points.
                    iv. Breathing air bank setup, tie in point and expected breathing air usage quantity.
                    v. Escape devices, 30 minute bottles, etc.
                    vi. Acid suits
                    vii. Drug testing
                    viii. Breathing tests and blood work
                    ix. Mask fit tests
                    x. Hearing tests
                b. Staging area determination
                c. Waste disposal (removed pipe, valves and hydro-blast contaminated water)

d. Hydro-test area
e. Tool trailer staging
f. Lunch/meal area determination
g. Hand wash stations and drinking water location determination
h. Identification of capital packages, what is purchased by owner and what is supplied by contractor? Determine delivery dates for all capital packages.
i. Identification of other parts and equipment, maintenance-like-items, that are supplied by owner? Which are supplied by the contractor?
j. Identify all packages to be installed by contractor
k. Identify all packages to be installed by the owner's personnel.
l. Identify all packages that require new foundations, structural steel or modifications to existing structural steel or foundations
m. Identify all packages that require new conduit/wire, instrument air, water, steam and process lines and purge gases.
n. Inspections and testing: column trays; hydro-test: re-boilers, coolers, exchangers; NDE as needed RT, PAUT, MT, PT, UT, visual.
    i. Identification of equipment, man ways, etc.
o. Equipment to open for cleaning and inspection: Columns, re-boilers, trays, hydro-blasting,
    i. An equipment list
    ii. Number of tubes or plates to blast
    iii. Method for plugging bad tubes or replacement of the tubes
    iv. Size of the flanges
    v. Tube inspection/testing
    vi. Type of gaskets, studs and nuts specified for closure
p. Equipment repair/replacement or additional pipe isometrics: nozzles added and MOC, PWHT, dimensioned isometrics and material specifications.
q. Valve replacements, material specifications, manufacturer
r. Pumps and the material, item specification, manufacturer
    i. Seals,
    ii. Seal coolant/lubrication system
    iii. Impeller housings
    iv. Impellers
    v. Couplings
    vi. Stuffing boxes
s. Pipe, material specifications
    i. Gaskets
    ii. Other fittings
    iii. Flanges
    iv. Supports, wear plates, wear pads, shoes, etc.
    v. Valves, TOL or WOL or BW
    vi. MOC
    vii. Paint

viii. NDE

t. Instrumentation, electrical, material specifications (Are these perhaps subcontractors?)
    i. Pressure Indicator
    ii. Pressure controller
    iii. Control valves
    iv. Temperature Indicator
    v. Temperature control
    vi. Level indicator
    vii. Level control
    viii. Flow indicator
    ix. Flow controller

u. Capital jobs (new foundations, added pumps, columns, tanks, vessels, pipe, coolers, chillers, etc. etc.)
    i. Discussions concerning long term item deliveries. Details of delivery and shop drawings of the items are shared to determine installation costs. Each individual package consideration can be:
        1. Cranes
        2. Crane assembly
        3. Crane Operators
        4. Oiler
        5. Transport to the site (if came in by rail elsewhere)
        6. Man-lifts
        7. Carry Deck Cranes
        8. Scissor Lifts
        9. Rigging
        10. Chain falls
        11. Compressed air
        12. Air impact tools
        13. Impact sockets
        14. Boiler Makers
        15. Welders
        16. Cutting Rigs
        17. Welding Rigs
        18. Pipe Fitters
        19. Electricians
        20. Carpenters (scaffolding)
        21. Drayage
        22. Laborers
        23. Equipment assembly

v. List get's more detailed depending on the scope of each package WBS

2. Constant communications with operations and maintenance adding more details
3. Schedule reflects general subject work (and then detailed WBS)
    a. Example:

i. Column “A”
    1. Tag and lockout all valves in and out of column “A”
    2. Pancake blind all lines at first flanges off of Column “A”
    3. Open column man-ways
    4. Environmental test of interior air of column
        a. Chemicals, VOC, or other IDLH materials etc.
        b. Explosive, LEL
        c. Oxygen >= 20%
        d. Temperature
        e. Cleanliness
        f. Industrial hygienists go or no go call
    5. Inspect trays
    6. Replace trays as needed
    7. Replace tray hardware as needed
    8. Replace tray bubble caps as needed (there are many different configurations of trays)
    9. Replace tray clips as needed
    10. PWHT if welding is required for tray clip/supports
    11. Remove re-boiler inlet and outlet spools
    12. Hydro-blast Re-boiler
    13. Repair steam leaks
ii. Column “B”
iii. Column “C”
iv. Reactor “A”
v. Reactor “B”
vi. Chiller “A”
vii. Boiler “A”
viii. Vessel “A”
ix. Pump “A”
x. Cooler “A”
xi. Re-boiler “A”
xii. Inner Condenser “A”
xiii. Etc, etc.

b. Materials specifications and Approved Manufacturer List on PDF files so ease of information transfer to suppliers can facilitate all processes.
c. THE MASTER PLAN, PLANNING BEGINS
    i. Individual packages are identified
    ii. Detailed WBS begins for all the individual packages
    iii. Kit list are developed, materials are gathered and stored as kit
    iv. A master checklist is monitored to assure all kits’ stock are complete
d. THE MASTER PLAN SCHEDULE BEGINS
    i. Type 1 master schedule is developed
e. Crew size determinations begin
f. Craft determinations begin

4. Meeting 2 (**120 days before turn-around**)
    a. BUDGET DEVELOPMENT
        1. Level 2 and 3 schedules are developed
        2. Defined packages
            a. Open, clean, inspect, repair as needed items
                i. All materials below delivery schedules
                ii. Spare column trays
                iii. Tray connection hardware
                iv. Tray bubble caps or other device
                v. Tray frame clips
            b. Capital Packages
                i. Major equipment > $100,000
                ii. Minor equipment < $100,000
                iii. Foundations
                iv. Structural steel
                v. New Pipe Isometrics Packages
                vi. Replacement pipe isometric Packages
            c. Service Packages
                i. Hydro-Blasters
                ii. Chemical Cleaners
                iii. Portable Storage tanks
                iv. Specialty welding crews
                v. Heat Treating crews
                vi. Catalyst Crews
                vii. Safety Services (certified personnel)
                    1. Hole watches
                    2. Environmental Testing
                    3. Rescue crews
                    4. Monitoring badge inventory and record
                    5. Scaffold, safety equipment inspection, monitoring, condemnation and repair/replacement and recertification as needed
5. Meeting 3 (**90 days before turn-around**)
    a. BUDGET DEVELOPMENT
    b. Level 4 and 5 schedules are developed
        i. Examples (note: 1 or more sections of work may fit on the schedule)
            1. Capital projects
            2. Boiler makers
            3. Electricians
            4. Pipe fitter & welders
            5. Instrumentation
            6. Operators and cranes
            7. Hydro-blaster
            8.
    c. Master Activity Checklist Development Review
        i. Determination of daily activities
            1. Manpower

        a. Crew size determinations
            i. Pipe fitters
            ii. Welders
            iii. Carpenters
            iv. Instrumentation Techs
            v. Electricians
            vi. Boiler Makers
            vii. Machinery Operators
            viii. Riggers
            ix. Millwrights
            x. Signal persons
    2. Machines
        a. Cranes
        b. Man-lifts
        c. Scissor lifts
        d. Carry Deck Cranes
        e. Forklifts
        f. Compressors
        g. Tools, Impacts, etc.
        h. Welding
    3. Methods
        a. Procedure each WBS
            i. Welding
            ii. instrumentation
            iii. Millwright
            iv. QA/QC packages
    4. Tools for each WBS
    5. Safety equipment for each task WBS
    6. MATERIALS

6. Meeting 4 (**60 days before turn-around**)
    a. BUDGET DEVELOPMENT
    b. Master Activity Checklist Development Review
        i. Determination of daily activities
            1. Manpower
                a. Crew size determinations
                    i. Pipe fitters Supervision
                    ii. Pipe fitters
                    iii. Welders Supervision
                    iv. Welders
                    v. Carpenters Supervision

vi. Carpenters
vii. Instrumentation Tech Supervision
viii. Instrument Techs
ix. Electricians Supervision
x. Electricians
xi. Boiler Makers Supervision
xii. Boiler Makers
xiii. Machinery Operators
xiv. Riggers
xv. Millwrights Supervision
xvi. Millwrights
xvii. Machinists Supervision
xviii. Machinists
xix. Signal persons

2. Machines
    a. Cranes
    b. Man-lifts
    c. Scissor lifts
    d. Carry Deck Cranes
    e. Forklifts
    f. Compressors
    g. Tools, Impacts, etc.
    h. Welding
3. Methods
    a. Procedure each WBS
        i. Welding
        ii. instrumentation
        iii. Millwright
        iv. QA/QC packages
4. Tools for each WBS
5. Safety equipment for each task WBS
6. MATERIALS, nuts, bolts, gaskets, etc.
7. Materials, consumables, welding rods, welding wire, gases, grinding disks, power cords and GFCI, etc. etc.

7. Meeting 5 (**30 days before turn-around**) Cost Risk Analysis
    a. BUDGET CONFIRMATION
    b. Personnel, drug and other testing. Testing occurs and then personnel go elsewhere. This even happens after work has starts. Predict costs and percent turn-over for budget analysis.
    c. Personnel interviewing
    d. Field Supervisor selection
    e. Meetings with field supervisors all WBS packages
    f. Assignment schedules and package schedules, all durations understood

    g. Master Activity Checklist Development Finalization

i. Determination of daily activities
    1. Manpower
        a. Crew size determinations
            i. Pipe fitters Supervision
            ii. Pipe fitters
            iii. Welders Supervision
            iv. Welders
            v. Carpenters Supervision
            vi. Carpenters
            vii. Instrumentation Tech Supervision
            viii. Instrument Techs
            ix. Electricians Supervision
            x. Electricians
            xi. Boiler Makers Supervision
            xii. Boiler Makers
            xiii. Machinery Operators
            xiv. Riggers
            xv. Millwrights Supervision
            xvi. Millwrights
            xvii. Machinists Supervision
            xviii. Machinists
            xix. Signal persons
    2. Machines
        a. Cranes
        b. Man-lifts
        c. Scissor lifts
        d. Carry Deck Cranes
        e. Forklifts
        f. Compressors
        g. Tools, Impacts, etc.
        h. Welding
    3. Methods
        a. Procedure each WBS
            i. Welding
            ii. instrumentation
            iii. Millwright
            iv. QA/QC packages
    4. Tools for each WBS
    5. Safety equipment for each task WBS
    6. MATERIALS, nuts, bolts, gaskets, etc.
    7. Materials, consumables, welding rods, welding wire, gases, grinding disks, power cords, low voltage lights, explosion proof lights and GFCI, etc. etc.