OVERVIEW

SIZING EQUIPMENT
  • Finding the right compromise

SUPPLIER PARTNERSHIP

BUILDING EXPANSION CONSIDERATIONS

TECHNOLOGY MUSTS

LEARNINGS
• As Architect Drew it
• **As Estimating Bid It**
• As Engineering Designed it
As Shop Fabricated it
As Field Installed it
• **What the Owner Paid For**
• What the Owner Really Wanted
DEVELOP YOUR OWN STANDARDS

• TAKE THE TIME TO WRITE YOUR OWN SPECIFICATIONS OR STANDARDS
  ◦ Determine what is important to you for consistency in brewery
  ◦ Common sections are:
    • Environmental conditions of brewery
    • Electrical
    • Mechanical
    • Documentation
    • Approved parts
  ◦ Living document that will change over time, better start early

• HAVE SPECIFICATIONS/STANDARDS WRITTEN INTO YOUR EQUIPMENT CONTRACTS
Plan for Growth

• How long to wait?
  ○ Start planning early.
    • Started active equipment selection and design 2 years prior
  ○ Make initial investment in project planning before you need it.
    • Size might change but functional design won’t
  ○ Consultants, conferences, brewery friends
    • Tremendous help for new technology
**Equipment Sizing**

- **Size for 10, 20, or 30 years?**
- **Compound Growth** \( A = P(1 + r)^t \)
  - 50,000 BBL starting point
  - 10% growth, 20% growth, or 30% growth

Graph showing volume in barrels over years with 10%, 20%, and 30% growth rates.
**Equipment Sizing**

- **WARNING**: Theoretical assumptions and values!
- **Assumptions:**
  - Brew 10 turns a day 24/7, 85% of year
    - Remaining 15% for Maintenance and Breakdowns
- **Size for 15-20 Year Growth**
  - 15 Years
    - 10% growth = 208,862 BBLs = 70 bbl brewhouse
    - 20% growth = 770,351 BBLs = 250 bbl brewhouse
BREWERY VISITS AND COLLABORATION

- NEW BELGIUM, LEFT HAND, BROOKLYN, VICTORY, TROEGS
- INVALUABLE
  - Learn from others optimizations
  - With each brewhouse installed technology is always getting better
- SEE INSTALLATIONS AND LEARN WHAT IS LIKED AND NOT LIKED
- BIG TAKEAWAYS:
  - Spent Grain Hopper sizing
  - “Hop out” process from hop back
**Manufacturer selection**

- **Long Term Partnership (Cultural Fit)**
  - Not a car dealer

- **Creativity**
  - Experience with designing equipment for brewing “American-style” beers or how you brew

- **Every Brewery is Different**
  - Have supplier brew with you on old system
  - i.e., Hopback, Whirlpool late additions

- **Level of Automation?**
Brewed the Hard Way
Brewed the Easy Way
Manufacturer selection

- **Level of Automation**
  - Mash in with your phone or require some manual interaction
  - PLC platform

- **Spare Parts Availability**

- **Installed Base (where are they installed?)**
  - Level of service and experience in your region?
To build or not to build…
Option One of Three

- **Add to Existing Brewhouse**
  - Downtime impact
  - Keep production running
  - Expand on challenges
  - Location challenges
  - Limits equipment size
    Options

**OPTION ONE**
**Actual Brewhouse**
To build or not to build…
Option Two of Three

- Install New Brewhouse in Existing Warehouse
  - Size and utilities limitations
  - Need warehouse space
To build or not to build... Option Three of Three

• **New Building**
  ○ More expensive, but space designed for function
New vs. Existing Building Evaluation

- **Zoning Restrictions**
- **Spatial Constraints**
- **Power & Water Infrastructure**
- **Adequate Toilet Room Facilities**
  - Accommodate Outdoor Beer Garden
- **Assembly Occupancy Code Requirements**
- **Odor Mitigation**
**Master Planning**

- Conceptual in Nature
- Project Phasing
  - Continue Production Through Construction
Master Planning

• Future Lauter Tun Planning
  ○ Significantly impacted building design
EVOLUTION OF A BREWERY

• PHASE 1
  ○ PRODUCTION
  ○ ADMINISTRATION
  ○ TAP ROOM
EVOLUTION OF A BREWERY

- PHASE 2
  - WAREHOUSE EXPANSION
  - PRODUCTION EXPANSION
  - COOLER EXPANSION
  - ADMINISTRATION EXPANSION
  - TAP ROOM EXPANSION
Evolution Of A Brewery

- **Phase 3**
  - Production Expansion
  - Administration Expansion
  - Cellar Facilities
  - Tap Room Expansion
Evolution Of A Brewery

- **Phase 4**
  - **Brewhouse Expansion**
  - **Grain Handling Expansion**
  - **Hop Cooler**
  - **Cellar Expansion**
  - **Tap Room Expansion**
Evolution Of A Brewery

- Phase 5
  - Cellar Expansion
Material Flow Considerations

- Materials
- Production
- Visitors

Material Flow Considerations
Brewhouse / Grain Handling Coordination
Systems Coordination

- Process Equipment vs. Building Systems
  - Who’s doing what and where it’s going…
Odell Expansion

- Silo pad
- Malt Handling department
- Steam Generator room
- Hop cooler
- Brewhouse – 135 bbl
- Tap Room
- Patio expansion
DESIGN CONSIDERATIONS

• **BE AWARE OF EQUIPMENT SPACE REQUIREMENTS**
  - Space between vessels
  - Piping need, no collisions
    - Zones of occupancy (Fire sprinkler, electrical, piping, etc.)
  - Mechanical needs
    - HVAC

• **COMMUNICATION WITH SUPPLIERS AND DESIGN TEAM…BOTH WAYS**
  - Malt Handling manufacturer
  - Brewhouse manufacturer
Design

- **Keep Supplier and Architect On Toes**
  - RB+B was fantastic
  - Check measurements, etc. …then check again
- **Malt Handling Tower**
  - Limited square footage
  - Equipment needs
**INNOVATION FROM LIMITATIONS**

- **NEEDED A FIVE VESSEL BREWHOUSE BUT NOT ENOUGH SPACE**
  1. Mash Mixer (Mash Kettle)
  2. Lauter Tun
  3. Pre-run (hot wort receiver)
  4. Brewkettle
  5. Whirlpool
    - Why five???
    - Throughput/Efficiency
      - Strive for 10 brews/day

- **SOLUTION: STACKED WHIRLPOOL/HOT WORT RECEIVER**
DESIGN

- COWORKER INVOLVEMENT
  - POST DRAWINGS
  - ASK FOR FEEDBACK

- SOAPBOX!
  - DESIGN EVERYTHING FOR LONG TERM MAINTENANCE
  - CAN ADD COMPLEXITY AND COST MONEY
 Odell Technology Musts

• **Look at Equipment before Shipment!**
• **Vapor Condenser**
• **HLT and CLT Heat Exchanger vs. Jacket**
• **Insulated Vessels**
  ○ Keep Heat in
• **Valve Monitoring - Close or Open**
  ○ Ability to monitor valves in manual or faulted
Malt Handling

• Future Silo Considerations
• Tower
  ○ Space constraints
  ○ Efficiency
• Vacuum vs Conveyor
Lauter Tun

- **Wide Range of Malt Bills**
  - From 10 Plato to 22 Plato
- **Challenge Supplier on Assumed Grain Amounts**
PROJECT MANAGEMENT

OWNER

ARCHITECT

GENERAL CONTRACTOR
CONSTRUCTION CONTRACTS

- **DESIGN-AWARD-BUILD**
  - Traditional Project Delivery Method
  - Competitive Bidding or Negotiation with one Contractor

- **DESIGN-BUILD**
  - Owner Contracts with one entity / Fixed price early in the Contract
  - Owner does not have as much control over design as other methods
  - Typically used by Owners with construction experience

- **CONSTRUCTION MANAGER / GENERAL CONTRACTOR (CM/GC)**
  - Owner Contracts with CM during design to provide constructability input
  - Guaranteed Maximum Price (GMP)
**Design Opportunities**

- Aesthetics
  That intangible experience that makes your space something special;
  Not just functional
Design Opportunities

- Branding
  The opportunity to integrate your operations’ unique personality into the built environment
Design Opportunities

- Create a ‘Destination’ worth going out of your way for
LEARNINGS

- **On-Site Crane used for Equipment Placement**
- **Be Clear about Commissioning Expectations and Conditions**
  - Supplier and Construction
- **Final Payment Requirements in Contract**
  - Hitting target efficiencies or brews/day
- **Translation**
  - 2 HMIs vs 2 screens
Learnings

- **Mash Mixer**
  - Damaging malt
    - Mash Mixer Agitator Speed
      - Too fast is another set of mill operation
    - Water amounts/ratio
- **Lauter Tun**
  - Grain bed depth and optimized lauterating (moving the plug)
- **Brew Kettle**
  - Cleaning Calandria tubes
  - Listen to equipment suppliers experience
**LEARNINGS**

- **Hop Back Design**
- **Wort Cooling Heat Exchanger**
  - Late addition
  - Type of pellet sizing and level of hopping
- **Make Sure Supplier Knows How You Brew**
  - Give them raw materials and adjunct samples
LEARNINGS

• **FLAVOR MATCHING**
  ○ Grain efficiency
  ○ Hop utilization
  ○ Specialty malt differences

• **AUTOMATION CAN BE A CULTURAL SHIFT**
  ○ Still need to look at vessels and brew

• **FASTER DOESN’T MEAN LESS LABOR**

• **HLT SHOP DRAWING ISSUE**
Summary

- Big project and a lot to take on
- Keep it fun
- Don’t wait too long to plan
- Added capacity, but overall improves quality and consistency!
THANKS!

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