

# **Cost, Time, and Resource Efficiencies of Modularizing and Prefabricating Facilities**



# OVERVIEW

- INTRODUCTION
- OBJECTIVES
- COST
- TIME
- RESOURCES
- PROJECT EXECUTION
- CONCLUSION

# INTRODUCTION

Jeff Runyan

Director of Strategic Growth at Halker Consulting

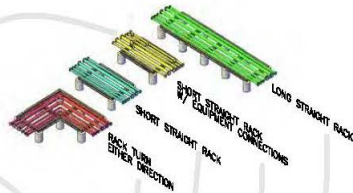
Former Marine Machine Gunner with 2 combat deployments to Afghanistan

Petroleum Engineer with 8 years of focus on upstream and midstream infrastructure

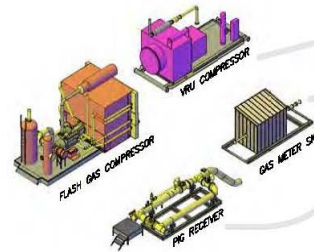
# PRE-FABRICATED, MODULAR FACILITIES

## PLUG 'N' PLAY FACILITY CONSTRUCTION

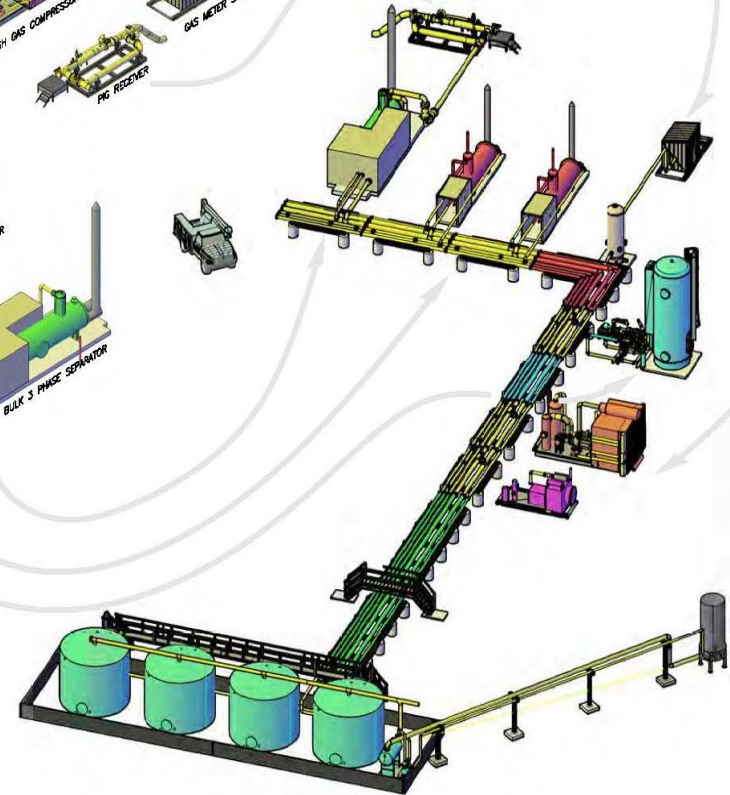
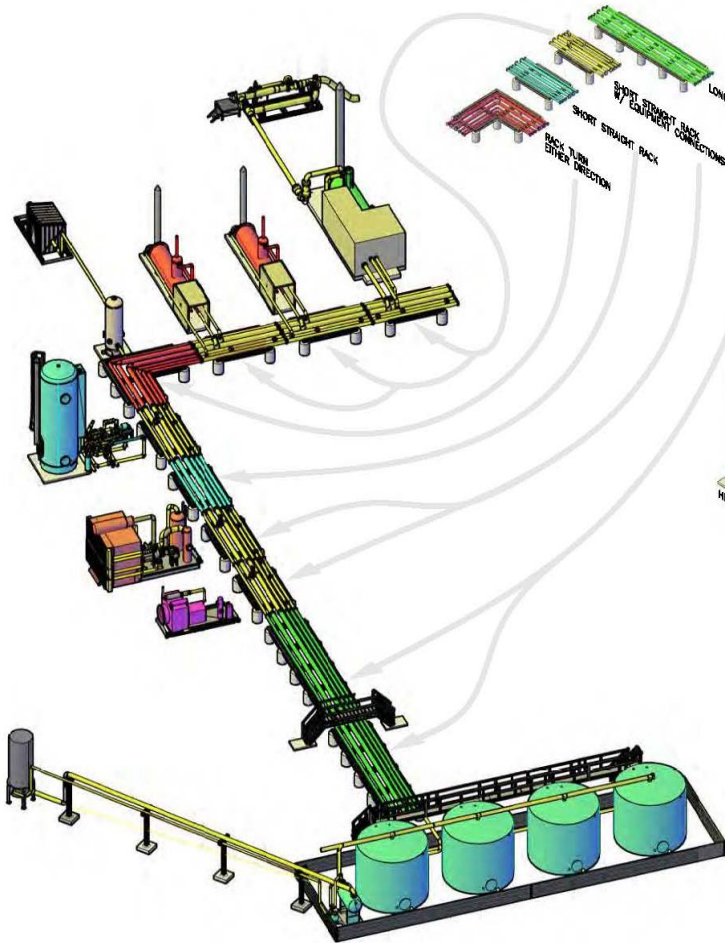
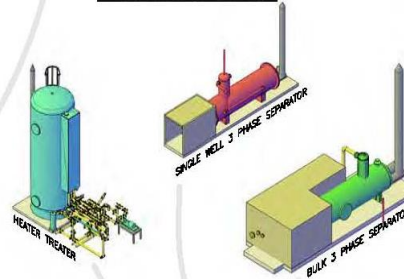
### PIPE RACK MODULES



### ANCILLARY EQUIPMENT



### EQUIPMENT SKIDS





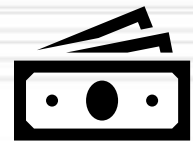
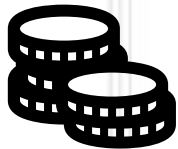
# OBJECTIVES

Provide an understanding of where the efficiencies are and how to obtain them



# COST, TIME, RESOURCES

- Cost is the most requested consideration for existing, new, or potential clients
- Cost is the catalyst for recommendation of modular, prefabricated infrastructure philosophy
- Time is the driver of most upstream projects
- It is a fallacy that shop fabricated designs inherently take longer total duration
- Resources need to be used at the right time in the right way to maximize efficiency



# EFFICIENCIES – PRE(SHOP)-FABRICATION

## Examples of Prefabrication Cost Efficiency

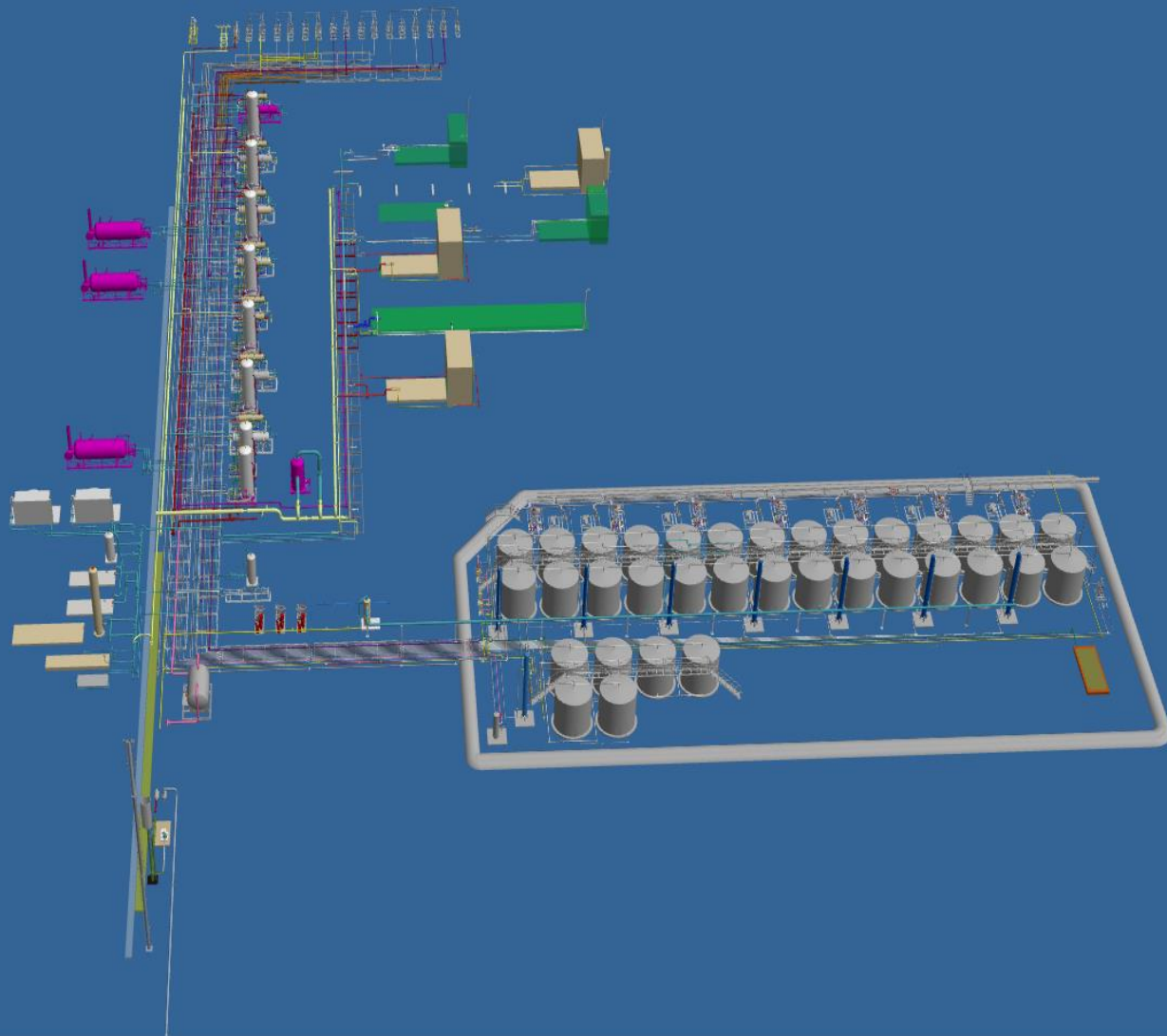
Position	Field Cost/Hr	Shop Cost/Hr	Controlled Environment Efficiency Gain	Dollar for Dollar Efficiency Gain
Welder	\$100	\$65	40%	61%
Welder Helper/Fitter	\$50	\$50	40%	40%
CM / Inspector	\$125	\$100	10%	28%
Electrician	\$95	\$70	35%	27%
Automation Technician	\$110	\$110	20%-40%	20%-40%

Does not consider paid weather delays, travel, or per diem.

### References:

Estimator's Piping Man Hour Manual  
Project After Action Reviews 2017 - 2019  
Labor Quotes

# EXAMPLE MODULAR FACILITY





# EXAMPLE MODULAR FACILITY



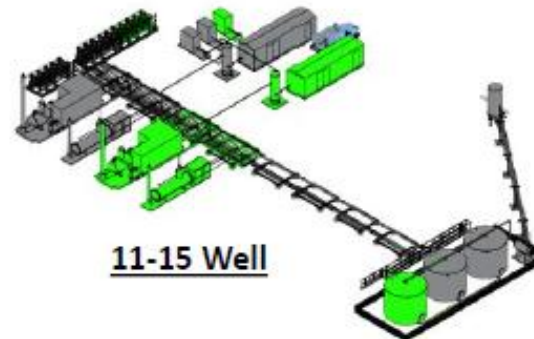
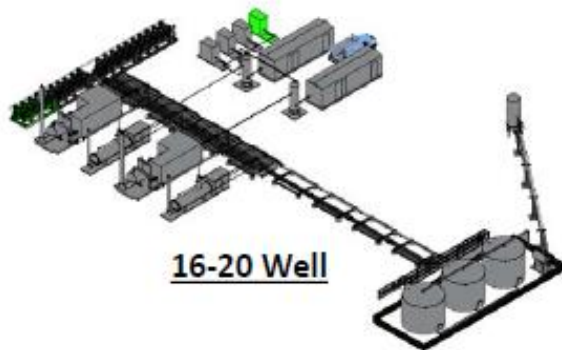
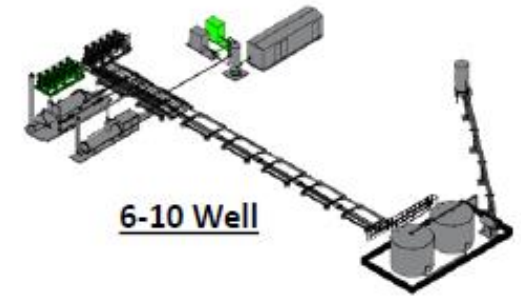
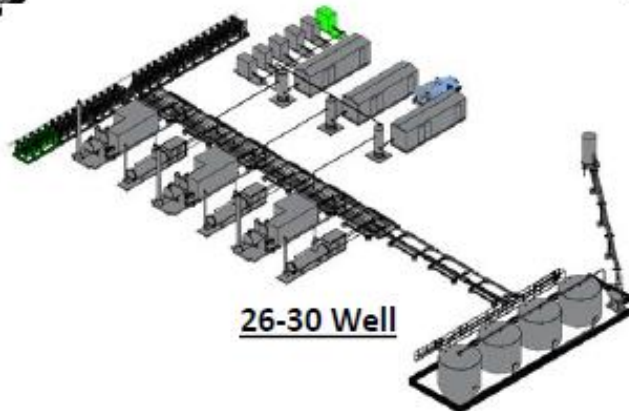
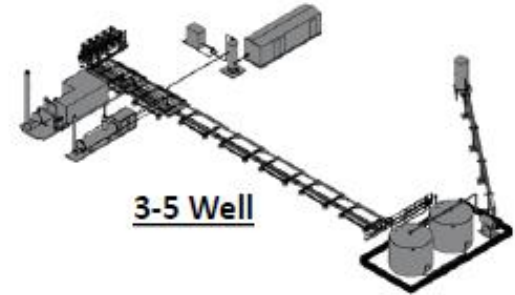
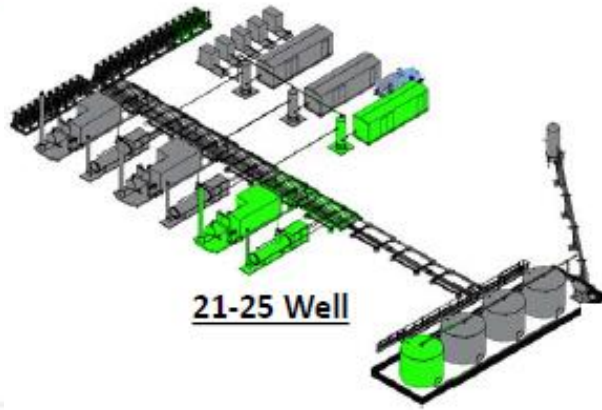
## Modularization Efficiency Opportunities

- Largely variable depending on module type and application
- Onsite pre-commission tasks reduced to:
  - Setting Modules
  - Bolt Ups
  - Limited Field Welds/Fits
  - Final Cable/Tubing Tie-ins
  - Leak Tests
- FAT test modules prior to shipping
- Scalable to each project
- Plug and play functionality for brownfield projects
- Modules can be reused if designed for broad application



# SCALABLE

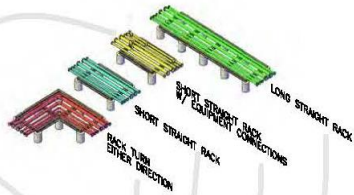
## Scalability



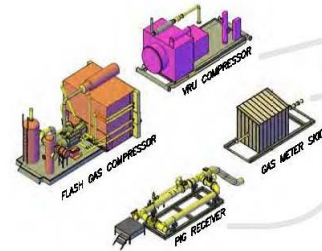
# PLUG N' PLAY

## PLUG 'N' PLAY FACILITY CONSTRUCTION

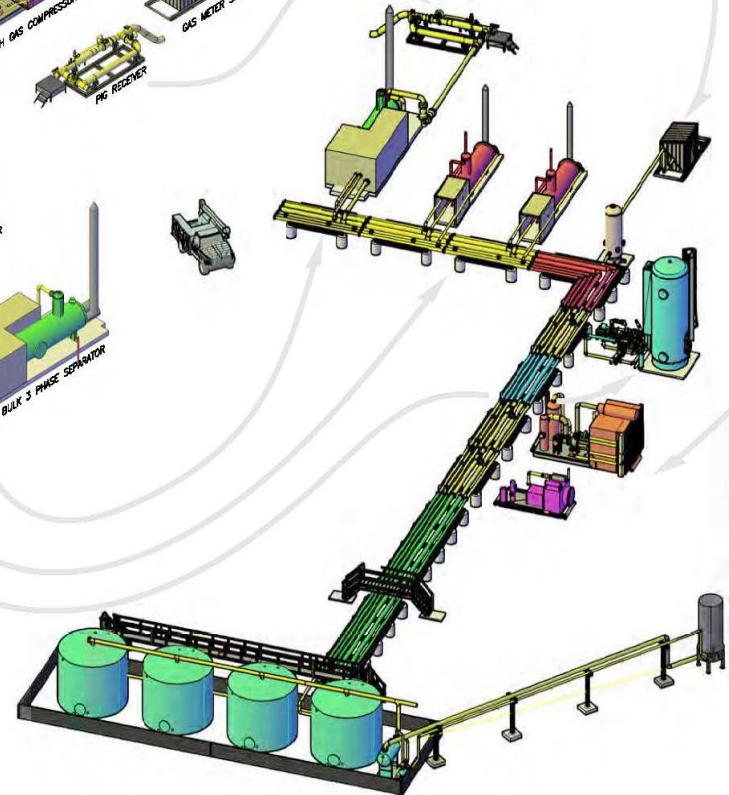
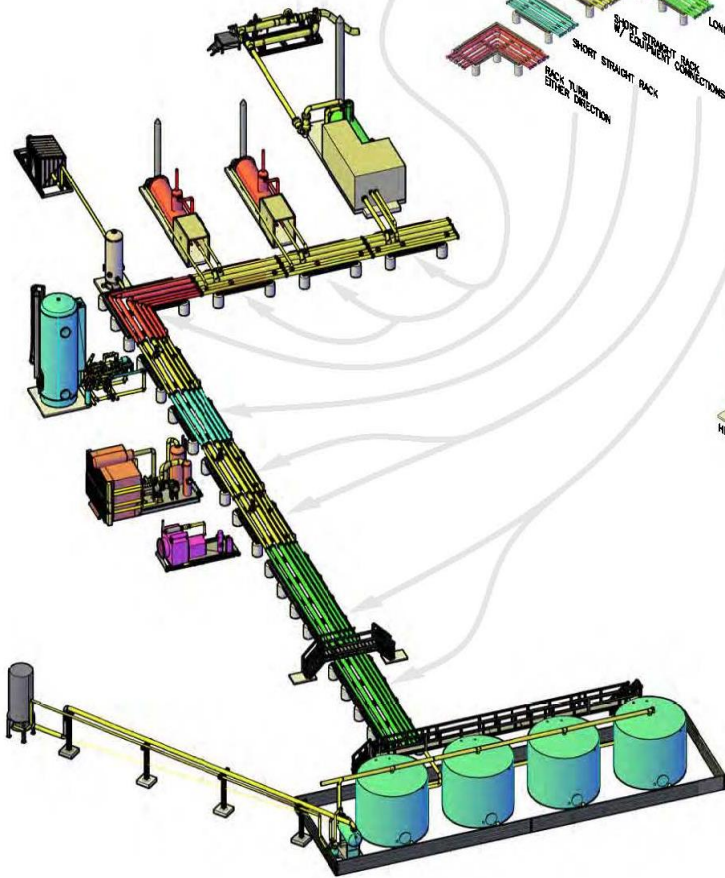
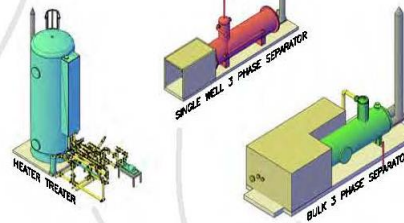
### PIPE RACK MODULES



### ANCILLARY EQUIPMENT



### EQUIPMENT SKIDS



## Keys For Success

- Quality Engineering Deliverables
  - Construction Focused Design
  - No Wasted Paper
- Procurement Coordination
- Stakeholder Buy-In
- Construction Management Bridges the Gap
- Solve More Than Today's Problem



## Take Aways

- Engineered CTR controls
- Construction focused design
- Solve tomorrows problem today
- Commit to a philosophy and don't look back
- Implement a build, measure, learn feedback system