Integrating Energy and Production Efficiency to Optimize an Olefins Unit

Cedar's problem

- How do integrate energy utilization and Unit Optimization into daily activities?
- Answer: Develop an integrated approach to evaluating unit data and providing operations personnel "knobs" to turn to make a positive impact on unit optimization.

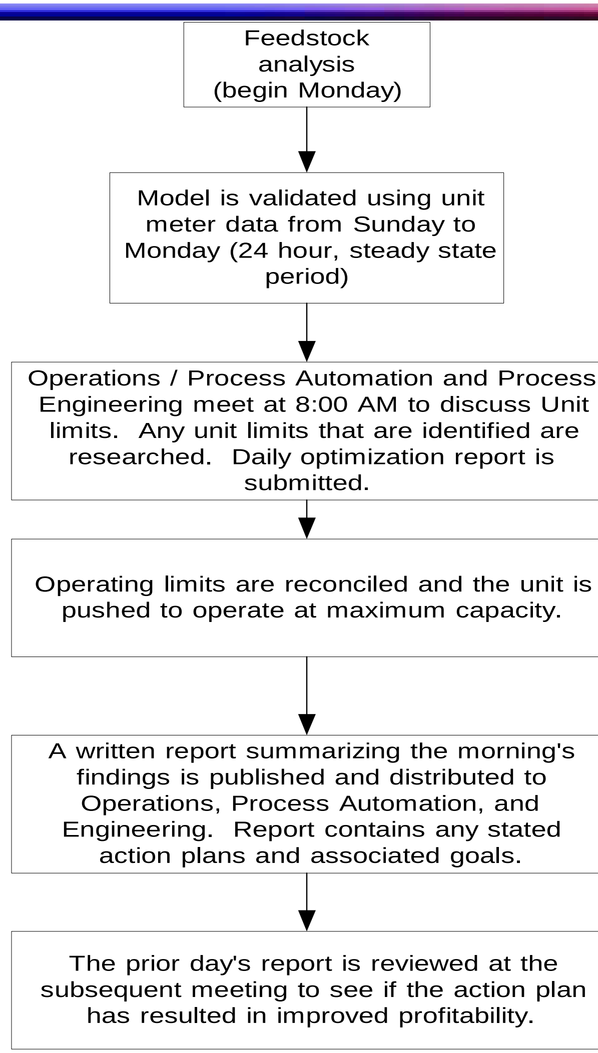
What's being done

- Focus on getting Operations, Controls and Process Engineering coordinated.
- Daily optimization review meetings lead by Engineering for Utilities and Ethylene Units.
  - Target audience are board operators
  - Focuses on bottlenecks and large energy hitters
  - Requires validating Advance process control with Feedstock models and understanding the differences.
- Daily deviation spreadsheet for Operations to review limits.
  - Focuses on detailed review of equipment by equipment unit limits.

Optimization strategy

- Provide monitoring tools for board personnel with variables that can be manipulated.
- Focus on the communication process between Operations, Automation and Engineering and identifying and resolving issues.
- Focus on communication between Utilities plant operations and Olefins plant.
- Each day any bottlenecks or Unit constraints that are not understood are identified and plans to resolve are put in place.

Optimization work flow process



Utilities Optimization report

Utilities Overview page 11/20/2006 9:56

600# boilers (HHV)		**Range**	**Cost savings ($/day)**
A boiler efficieincy	**#DIV/0!**		
B boiler efficiency			
C boiler efficiency			

600# variables	
A boiler overview	
Firebox O2	
Firebox NOx (lb/hr)	
FGR steam (lb/hr)	
FIR steam (lb/hr)	
steam/fuel raitio	
B boiler overview	
Firebox O2	
Firebox NOx (lb/hr)	
FGR steam (lb/hr)	
FIR steam (lb/hr)	
steam/fuel raitio	
C boiler overview	
Firebox O2	
Firebox NOx (lb/hr)	
FGR steam (lb/hr)	
FIR steam (lb/hr)	
steam/fuel raitio	

400# Boilers (HHV)	
B-102 A boiler	
A boiler efficiency	
B102A CEMS NOX Analyzer	
B102A CEMS CO Analyzer	
B-102 B boiler	
B boiler efficiency	
B102B CEMS NOX Analyzer	
B102B CEMS CO Analyzer	

1592 optimization page

Letdown Values	Mlb/hr	**Range**
600 --> 400		
600 --> 200		
400 --> 100		
200 --> 50		
170 --> 100		
170 dump in NAO		

EF-751 Cooling Tower	
CWT Temperature	
CWT Pressure	

HFO for fuel usage	flows (Mlb/hr)	
A boiler		
B boiler		
C boiler		
Total HPO firing		
HPO from 1592		
HPO tank level (%)		
Difference in flow		
Natural gas import		There is room to add a

TANK LEVELS	**feet**
FB-705 HPO	
FB-706 W/C	
FB-710 HAD	
FB-712 LPO	
FB-850 Demin	
FB-930 Storm	
FB-918 Storm	
FB-702 Waste	

OTHER	
% BFW from Fresh	
600# Stm Balance	
400# Stm Balance	
100# Stm Balance	

1592 Summary Optimization report

1592 Optimization Page	*11/20/06 9:58 AM*	**Hit F9 to Update*

Feed Slate	
Current	
Target	

CLP Limits	Value	Limit
CLP		530
Charge Gas		1
Prechill		1
Demethanizer		1
Deethanizer		1
Ethylene Fractionator		1
Furnaces		1

Tower DPs	Value	Limit
DA-202		
DA-203		
DA-301 Top		
DA-301 Bottom		
DA-401 Top		
DA-401 Bottom		
DA-403 Top		
DA-403 Bottom		
DA-404		
DA-406 A		
DA-406 B		
DA-490 A		
DA-490 B		
DA-490 C		
DA-405		
DA-408		

Fuel Gas	Value	Limit
SG		
FG Make-up		
Praxair Production		
Praxair Bypass		
HFO Burned		lb/hr
FB-705 Tank Level		%

Legend	
CLP Limits	0-not limit, 1-limit
	Not at limit/target
	At or above limit/target
Blue Font Text	Manual Input

Production	Ethylene		Propylene		Acetylene	
	Actual	Target	Actual	Target	Actual	Limit
Current						

Unit Feed	Flow	Pressure	SG
1st LFS			
2nd LFS			
80/20			
5/95 to FA123			
5/95 to FA-118			
PP Import			
Total 5/95 Meter (8276)			

Tower Leakages	Value		Range
DA-301 Bottoms C1		ppm	
DA-401 Bottoms C2		ppm	
DA-403 Top C1		ppm	
DA-403 Top C2		ppm	
DA-403 Bottoms C2=		mol%	
DA-406 Top C3		ppm	
DA-406 Bottoms C3=		mol%	
DA-490 Top C3		ppm	
DA-490 Bottoms C3=		mol%	

Tower Pressures	Value	Limit
DA-301		
DA-401		
DA-403		
DA-404		
DA-406		290

Steam	Flow	Target	
1500-600 Letdown			
600-200 Letdown			Mlb/hr
200-50 Letdown			Mlb/hr
Steam to Main Flare			lb/hr
Steam to Acetylene Flare			lb/hr
600# Import from Util			Mlb/hr

C3= Refrigerant		
EA-315 Propylene Flow	#ERROR 501(	Mlb/hr
EA-315 Propylene Temp	(32.98)	deg F
EA-315 HP CH4 Temp	#ERROR 501(	°F
EA-501 CW Out (Max-Min)	#NAME?	DT deg F

Furnaces	Feed Rate	Sev/Conv	Target	Avg COT
E/P				
NG				
NB				
C2				
C3				

Compressors	GB201		GB202		GB
	Value	Limit	Value	Limit	Value
Flow					
Speed					
Horsepower					
Suction Pressure					
Discharge Pressure					
Throttle Steam*					
Extraction Steam*					
Condensing Steam*					
Steam Imbalance					

* Max steam flows are for max speed, max power case

CG Dryer DP	Bottom	Limit	Top	Limit	Total
FA-211 A			-		-
FA-211 B			-		-

Total C2s	Value	Limit
Product		
Recycle		
Total		

Deethanizer Bottoms		
Flow		Mlb/hr
Output		%

Total C3s	Value
Product	
Recycle-406	
Recycle-490	
Total	

C3 Stream Compositions [mol%	
	DA-409 Btms
Methane	
Ethane	
Propane	
Propylene	
Total C4s	

1592 Furnace Strategy

Furnace	Feed Type	Total Feed	Avg. Dil Steam	Dil Stm. Proj.	delta dil stm $/day diff	Max TMT	Box O2	Stack O2	Stack Temp	Fuel Rate
BA-101										
BA-102										
BA-103										
BA-104										
BA-105							1.99			
BA-106										
BA-107						1951				
BA-108										
BA-109										
BA-110										
BA-111										
BA-112										
BA-113										
BA-117										

Furnace	BTU/Feed	BTU/feed (RTO)	RTOPT Eff.	Crossover temp	Avg COT	Target COT	deviation
BA-101							
BA-102							
BA-103							
BA-104							
BA-105							
BA-106							
BA-107							
BA-108							
BA-109				1118			
BA-110							
BA-111							
BA-112							
BA-113							
BA-117							

List of items identified and resolved unit issues to date.

- Furnace limits
- Demethanizer differential pressure
- Fuel gas meter corrections
- C2 Splitter resolution
- Propylene refrigeration machine troubleshooting.
- Deethanizer bottoms constraint.
- Condensate stripper
- Fuel Balancing and Fuel Oil optimization

Energy improvement overview

- Since start-up, have seen an average improvement in EII of 5.8%.
  - Reliability and NOx project improvements are responsible for 3.3% EII improvement.
  - Remaining 1.5% EII can be attributed to clean unit from start-up and daily optimization meetings.
- Average letdown improvements have resulted in approximately $1000/day improvement in steam cost.

Performance Audits

1. Maximize Profit
   a. Better day to day optimization
   b. Tools for process studies for troubleshooting and performance improvements.
   c. Improvements to Automated Process Control
   d. Improvements to Feedstock Model
2. Identify the best capital projects (establishes heat and material balances for doing projects)
3. Improve reliability
4. Insure safety (HAZOPS, PSM)
5. Established "engineered" energy targets that optimize profit.
6. Training benefit.