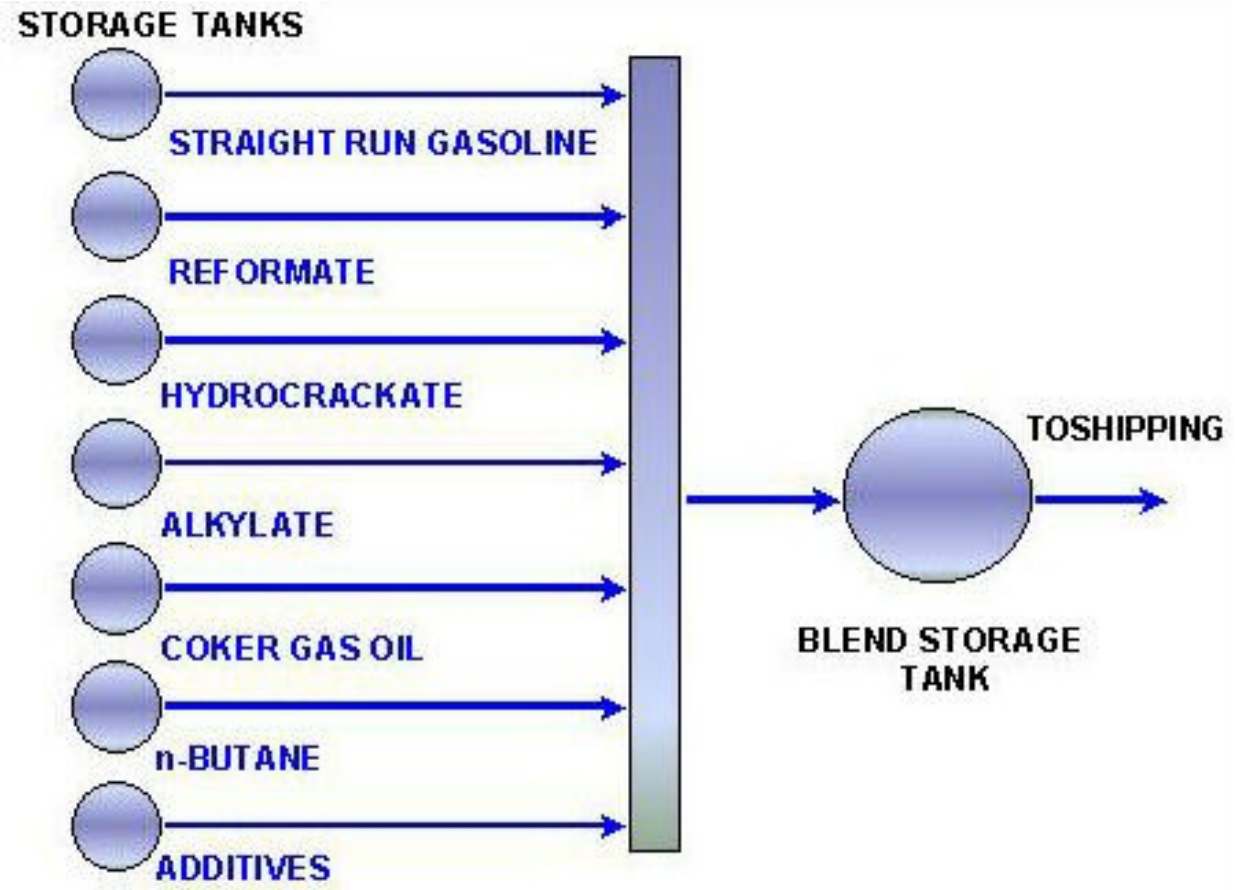
Refining

Gasoline Blending Optimization

Outline

- Gasoline Blending Overview
- Online Blend Controller & Optimization
- Benefits

Blending Overview



Regulatory Level

- Blend lineup and component selection
- Recipe handler with pacer
- Volume integrator
- Quality reports
- Good solutions available at DCS level

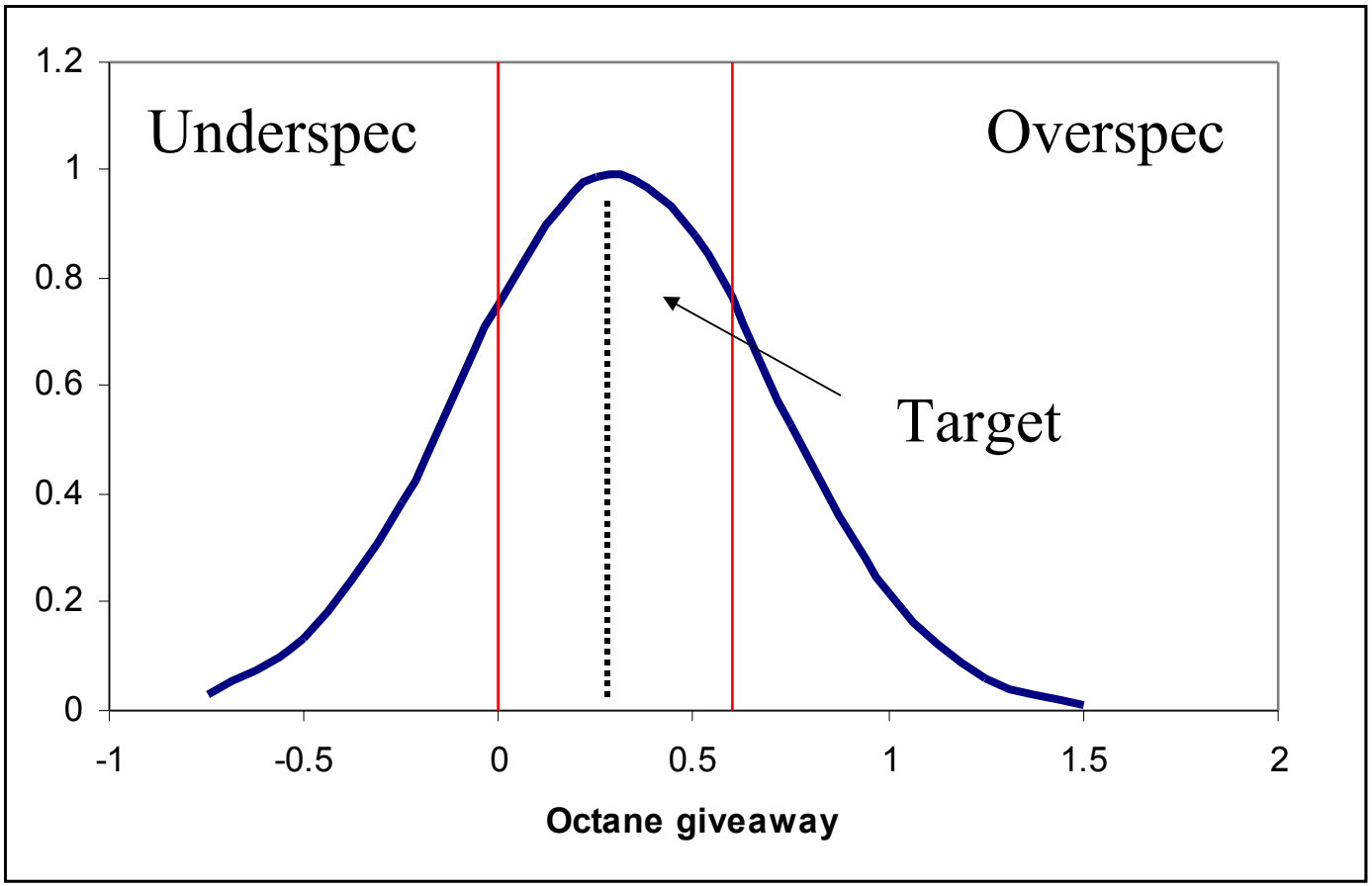
Evolution of Blending Advanced Control

- Manual systems
- First level control
- Current technology

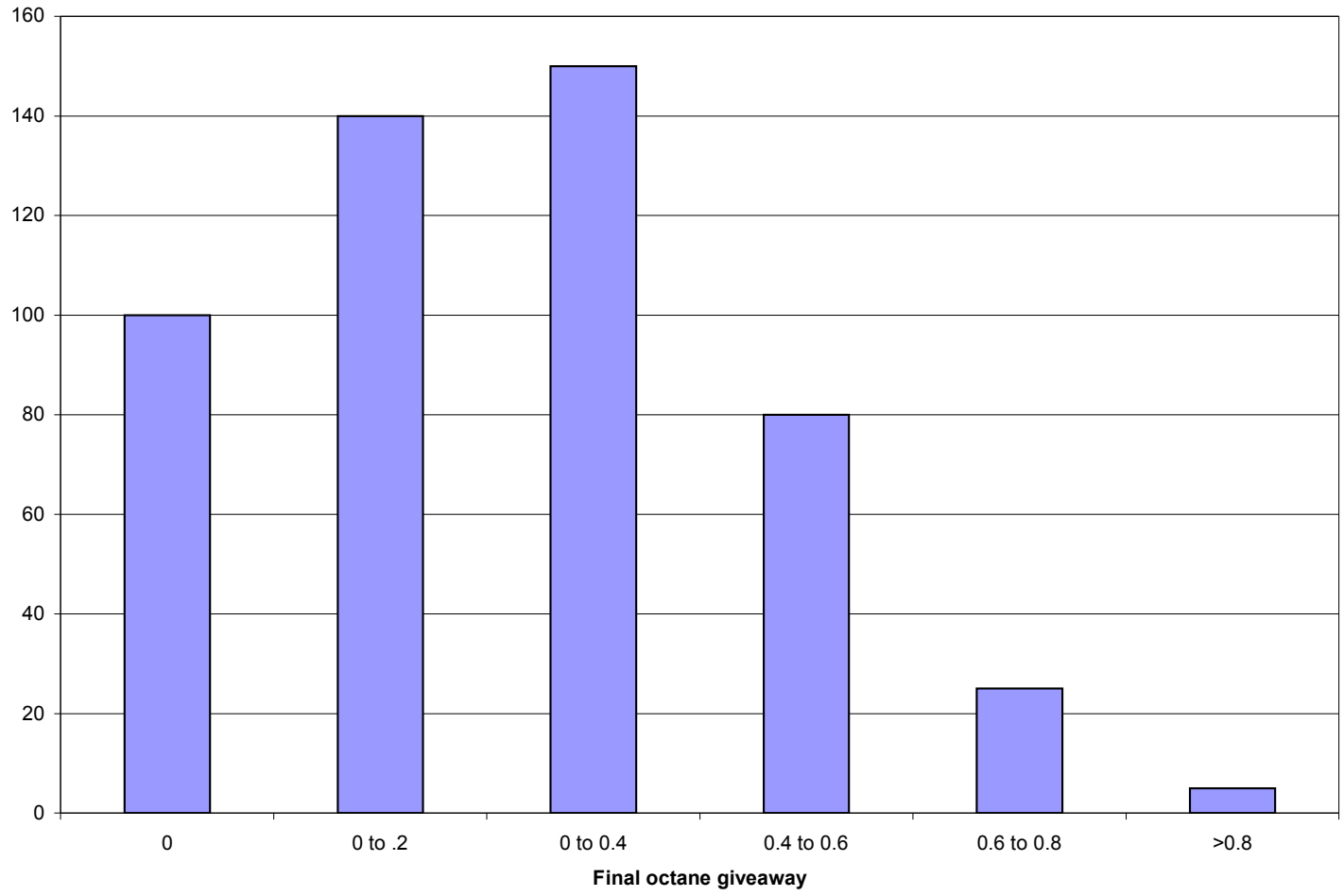
Manual Blending

- Typical giveaway 0.35 octane numbers
- Can be reduced with reblends
- Lab sampling during blend
- Expert corrects recipe on the fly

Initial Quality Distribution



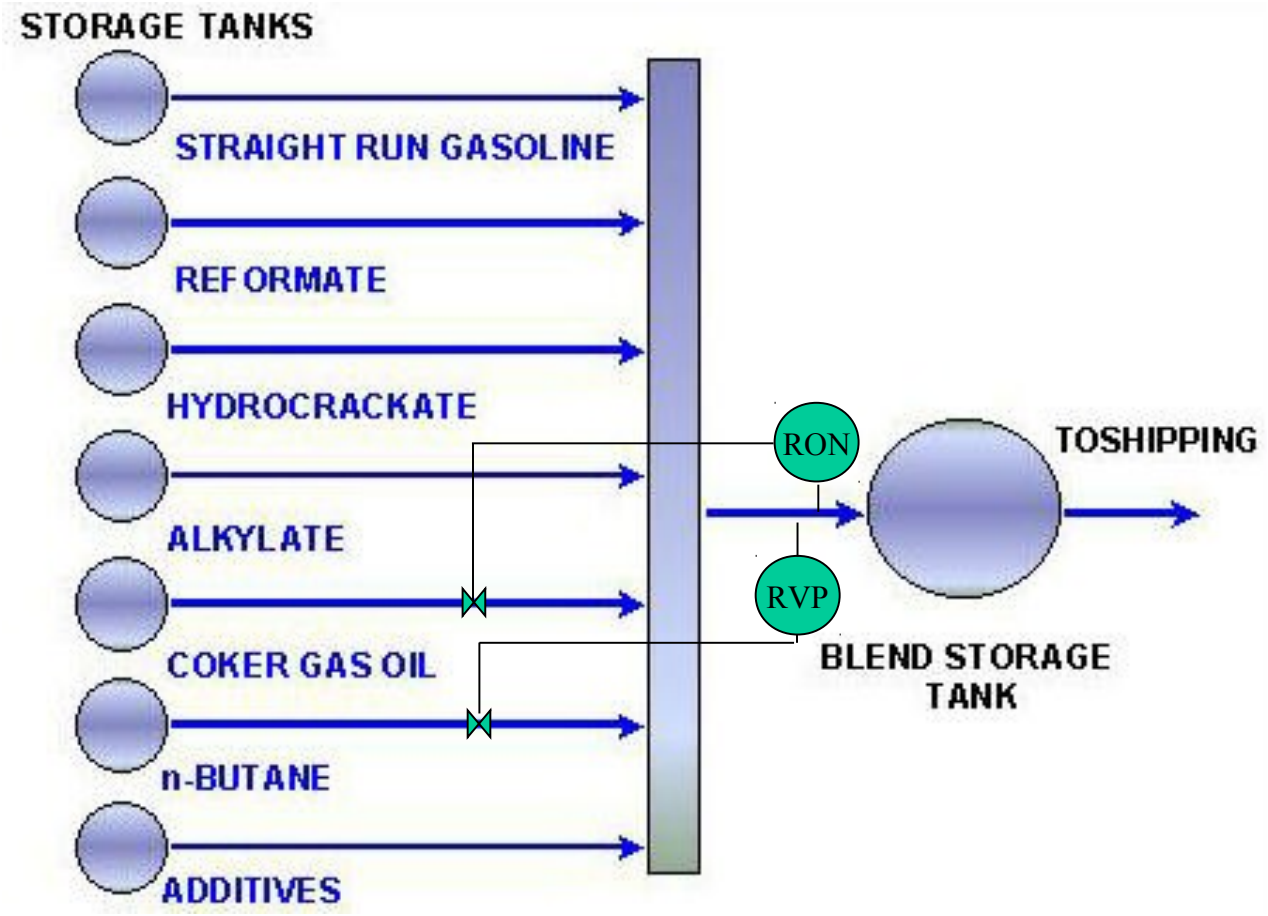
After reblending



First Level Control

- Trim blend with online analyzers
- Simple PID loops

Example of First Level Control



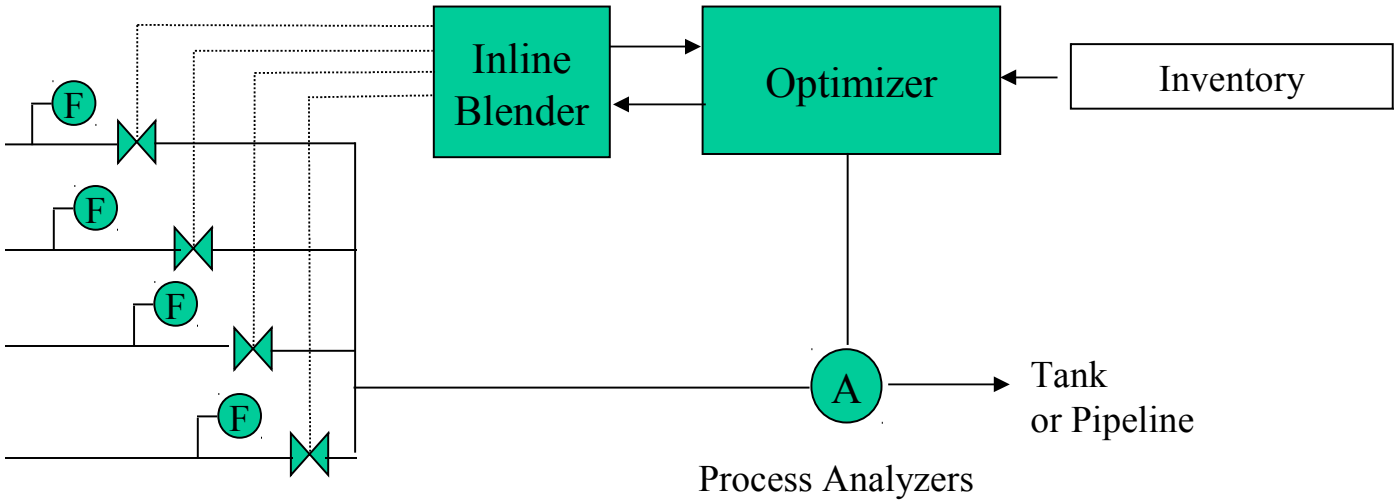
First Level Control

- Reduces giveaway
- Can hide an unprofitable operation

Opportunity Cost

Component	Price	Recipe 1	Recipe 2	ROAD	RVP
A	$4.60	0	17.8	74.05	4
B	$13.50	0	0	86.45	4
C	$9.50	0	66.3	85.76	13
D	$26.88	23.8	0	101.75	0.5
E	$27.58	0	0	102.5	0.5
F	$0.00	4.5	5.9	97.3	66.74
G	$2.50	61.7	0	76.5	16.45
H	$27.50	10	10	115	16
I	$16.16	0	0	93	12
Average Cost $/BBL		$10.69	$9.87		
Spread		$0.82			

Modern Blending



Why Blend Optimization?

- Eliminate reblends
- Reduce quality giveaway: $0.35/octane barrel
- Make recipe changes consistent with refinery drives - example: maximize low cost components

What is a Blend Optimizer

- An integrated suite of control technologies designed specifically to optimize on-line performance of the blender
- An applications product, not a generic software tool or algorithm
- The best control technologies are imbedded directly into the application giving the operator trouble-free operation

The Cost of Giveaway

- LP gives marginal values for limiting specs
- These values are conservative
- Zero giveaway after reblend may not be "free" if achieved with expensive components
- Currently, average giveaway cost for a 100,000 BPD refinery is $100,000/month

Elements of Blend Optimizer

Philosophy

Blending Models

Precise Recipe Adjustment

On-line properties predictor

Update Planning Blend Values

Controller/Optimizer

Automatically Capture Benefits

Benefit Areas

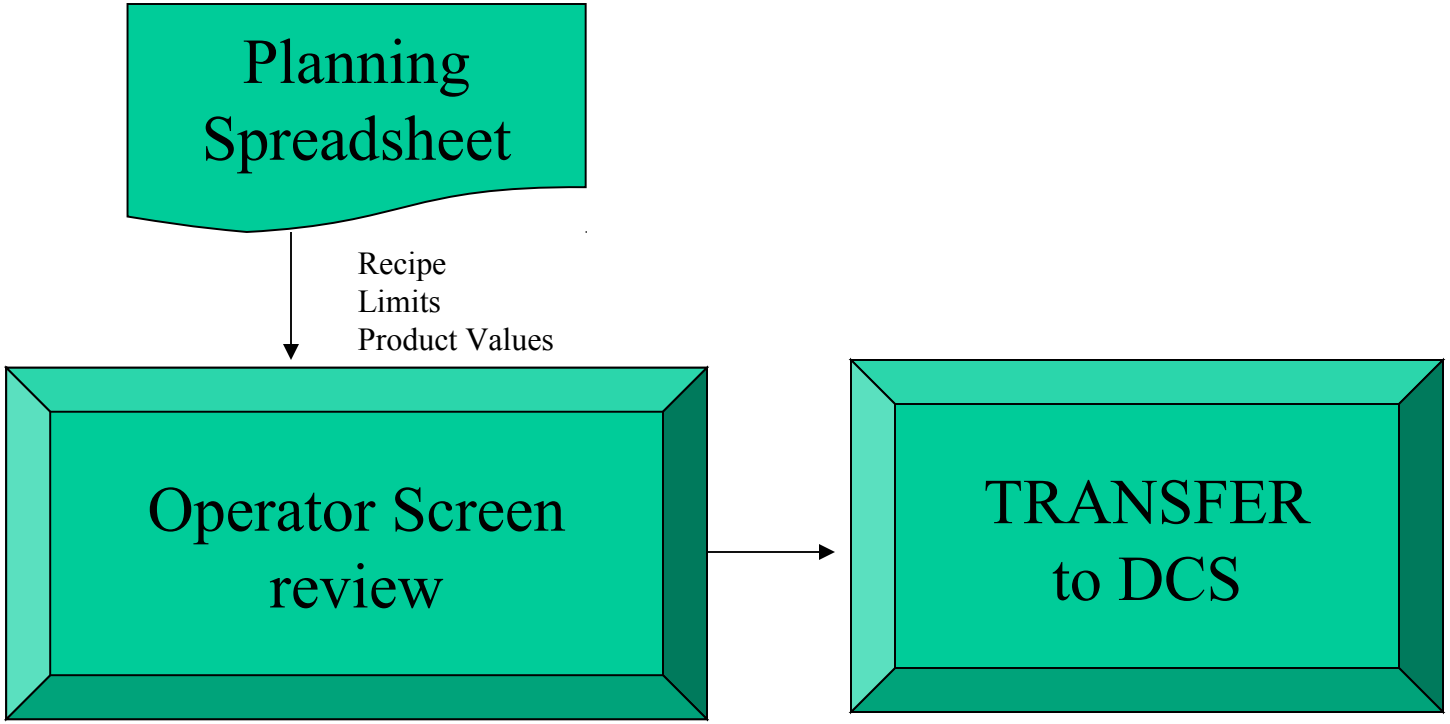
- Reduced variance cuts giveaway costs in half
- With online certification, blend target can be precisely at specification
- System consistently enforces lowest cost policy
- Up to date blending values for LP

Blend Optimization Opportunity

- One year payout
- Meets today's and tomorrow's blend challenges
- Maintain competitive market position

Only an on-line optimizer is able to guarantee that the benefits are captured

Flowsheet


Planning Spreadsheet
Recipe
Limits
Product Values
Operator Screen review
TRANSFER to DCS

Summary

- Blend Optimization Highly Profitable
- Technology battle-tested
- Payout < 1 year