Hoekstra Trading LLC

Sensible catalyst selection

A sensible approach for confident decision-making and maximum profit

Contents

What is a good work process for catalyst selection?

A good work process for choosing hydroprocessing catalyst is made up of the following steps:

1) The unit engineer requests proposals and quotes from catalyst suppliers.
2) The suppliers respond with proposals.
3) The unit engineer leads a work group to evaluate the proposals
4) The decision is made and communicated to all the suppliers

Here is a template for a request for proposal (step 1):

Dear Supplier,

We are requesting your proposal for the upcoming refill of Unit _____.

- *Description of unit*
- *Performance objectives and unit constraints*
- *Feed properties*
- *Catalysts required*
- *Schedule and contacts*
- *Please include in your proposal*
    - *Loading diagram*
    - *Recommended loading method*
    - *Loading, presulfiding, startup procedures*
    - *Estimated start of run reactor temperature*
    - *Product yields, qualities, and hydrogen consumption*
    - *Expected cycle life*
    - *List of catalyst poisons and maximum acceptable level in feed*
    - *Service provided*
    - *Price quote and fill cost*

The decision matrix of Table 1 is a good tool for summarizing and evaluating the proposals, and making your decision (steps 3 and 4).

	Albemarle	*ART*	*Axens*	*Criterion*	*Topsoe*
Performance					
Service					
Cost					

How do refiners choose catalysts today?

Steps 1 and 2, about getting supplier proposals, are in common use in the industry.

In steps 3 and 4, practices vary all over the map:

- In some cases, it's a last minute, emergency purchase.
- In some cases, it's an elaborate process with cross-functional committees, site-specific pilot plant tests, legal negotiations, supplier audits, meetings galore, 50-page contracts, and months of haggling.

Neither of these extremes makes much sense if the goal is to make confident decisions for maximum profit.

A sensible approach

Let's step back and consider, what is a *sensible approach* for buying catalyst?

We all make purchase decisions, from big decisions like buying a new house or car, to buying gasoline. With experience, we develop a common sense for how to approach different kinds of purchase decisions.

Is buying catalyst more like buying a house or buying gasoline? Or is it something in between, like landscaping, a car, or a computer?

In the next section, we consider a purchase decision analogous to the replacement of catalyst. It is the replacement of the air conditioning system in your home or office (or, if you're in Ft. McMurray, your heating system). This is a useful analogy for many reasons. For the current purpose, it will serve as a model for a defining a *sensible decision process* for catalyst.

Catalysts and your air conditioner

Like a catalyst system, a central air conditioning system must provide the right capacity; it must be fit for the service, it must be balanced to fit within the existing infrastructure; it must be installed correctly, and perform reliably.

After it's installed, you don't want to think about it much. It should just work reliably, as advertised, while you focus on other things.

In case of problems or failure, you need immediate response and help from your supplier.

Like a new air conditioning system, catalyst is a high cost item – certainly one of the largest third-party purchases in your annual budget. So cost is an important factor.

Air conditioning systems and catalysts both wear out over time; and new, better products are always being developed. According to Consumer Reports, "new air conditioning systems are 20 to 40 percent more efficient than those of 10 years ago"– similar to catalysts. When it comes to replacement, you'll look for a better model than the 1990's version you're replacing.

You don't want to become a career expert in either air conditioners or catalysts. You just want to make a good buying decision.

You want to buy from a proven, reputable supplier with a solid track record.

That's a good list of parallels.

The decision matrix of Figure 1 would be good for use in deciding on a new air conditioning system:

	Carrier	*Goodman*	*Lennox*	*Rheem*	*Trane*
Model	Infinity	DSXC18	XC25	Classic	XR14C
Performance					
Service					
Cost					

Chances are, when it's time to replace your air conditioning system you'll probably do something like this. When your system nears the end of its life, and before it fails, you will do some research, get the data for a matrix like this, consider your options, and make an informed decision. It is a common sense approach for a purchase like this.

It is certainly more sensible than an emergency snap decision, or an overkill project with lots of meetings, lawyers, stacks of brochures, haggling, and 50-page contracts.

Common sense catalyst selection

We now return to catalyst refill decisions.

Common sense suggests that a matrix like this should be a good tool for choosing catalyst.

Our experience confirms that. We know that those who use a simple matrix like this for catalyst decisions, and fill it with good data, get good results from their process, meaning they consistently get industry-leading catalysts performance, good service, and good prices.

Here is a real-life example, for a ulsd unit:

	Albemarle	*ART*	*Axens*	*Criterion*	*Topsoe*
Product	KF 767	420DX	HR 626	DC2618	TK-578
Performance					
Δ Start-of-run Temperature (WABT, °F)	base	-5 °F	base	base	-10 °F
cycle life, months	18	20* *or could run 7.5% more LCO for 18 months, worth + $1.5 million vs base	18	18	22* *or could run 15% more LCO for 18 months, worth + $3.0 million vs base
Service					
knowledge of unit				long-time incumbent knows unit	
technical support	new staff is relatively inexperienced				
relationship management		don't seem as hungry for our business	too secretive		
Cost					
fill cost, $	$3,600,000	$2,700,000	$2,700,000	$3,600,000	$3,000,000
color codes					
a strength					
neutral					
a weakness					

Decision criteria were kept to the basics:

- Performance: Relative rankings were based on our pilot plant tests. More active catalysts got credit for lower start of run temperature and longer cycle life.
- Service: Supplier services were assessed qualitatively by the refinery team, noting only the biggest factors that stood out as relative strengths or weaknesses compared to competitors, based on first-hand experience and data from other catalyst users.
- Cost: was compared on total fill cost based on site-specific supplier proposals.

These five suppliers are all fully capable, credible catalyst suppliers. Therefore, secondary factors, and any factors that could not be objectively assessed, were left out of the decision matrix.

If you start including too many soft criteria, or over-engineering the decision, it is too easy for personal biases to creep in and dominate the decision, taking the focus off objective assessment of profitability.

This is a good, proven work process for refiners who want to focus on profitability. The data in the grid will vary from case-to-case, but the process works well for all ulsd units.

In fact, some refiners have adopted this streamlined process for all their catalyst purchases, across all their refineries, with great success.

Don't over-engineer catalyst selection?

In practice, catalyst selection is not this clean and neat for most refiners. There are two main reasons.

First, the catalyst industry has a secretive culture which resists transparency of competitive product information. Refiners are left in the dark on competitive product performance. Without good data to fill in the critical rows in the matrix, refiners must depend instead on vendor data, which is usually biased, and never in apples-to-apples terms.

Second, many refiners don't choose catalysts for profitability. For them, catalyst supply is about a relationship, not profitability. The culture of the catalyst industry encourages this. So, while they go through the motions of making decisions for profitability, they always stick with the incumbent supplier.

We discourage the buddy system as a work process for hundred million dollar spends. There are too many good suppliers, and too many good opportunities, to accept entrenched incumbency as a good solution.

Where can you get the data?

Going back to air conditioning systems, Consumer Reports' buying guide says that:

"Any good supplier can calculate the size of the cooling equipment you need by using such recognized methods as the Air Conditioning Contractors of America (ACCA) Manual. The same manual can be used to confirm that your ductwork and supply registers are fit to deliver the load . . . Be leery of contractors who bases estimates merely on house size or vague rules of thumb."

In air conditioning, things are made easier by the availability of accepted methods used by all suppliers and that you can find in a manual like the ACAA Industry Manual. That makes sense.

But unfortunately there is no "Catalyst Suppliers of America Manual" to reliably tell you what kind of catalyst is needed to do the job.

For air conditioning systems, Consumer Reports surveyed 34,000 readers who bought systems from 2007 to 2013. From this data, they identified the most and least reliable brands, and suppliers to avoid:

"You may want to give York, Goodman, and Amana central air systems the cold shoulder. These brands logged a greater percentage of repairs among owners than the three brands at the top of our Ratings: American Standard, Bryant, and Trane".

That's useful information from a credible, independent source (lots of experienced users like you), and it makes sense to use it.

But most refiners don't have data like that for catalysts.

To make a sensible catalyst decision, you need good independent data to compare the relative performance of different suppliers' catalysts; and it is very helpful to have hard data from other catalyst users on supplier services and competitive pricing.

You cannot get that from catalyst suppliers.

That is what we provide.

What about other types of catalysts?

So far, we have been talking about ultra-low sulfur diesel hydrotreating (ulsd) catalysts. What about other types of catalysts?

For vacuum gas oil (VGO) hydrotreating and hydrocracking catalysts, differences in product yield selectivity and quality must be considered as primary performance factors in your decision. These differences can be measured in side-by-side, site-specific independent pilot plant tests, but that kind of testing is more costly and difficult to standardize. Although we don't have a standardized test for these applications, we have good methods to help refiners choose these catalysts, and we have the capability to run side-by-side, site-specific pilot plant tests on your feeds using the best independent test platform in the industry.

Our clients also want better methods to choose FCC catalysts, and we are venturing into that as well.

Assessing your catalyst selection process

Our product, Independent Catalyst Test Report, shines the light on what has been hidden from view. We have a large database from 6 years of testing competitive hydroprocessing catalysts in a standardized ulsd test program. We have also done market research on the catalyst industry. Our market research provides you with the data you need for common sense catalyst selection.

Maybe you are, today, using the very best catalysts for your situation, or maybe you have big opportunities to increase profit with improved catalysts. These opportunities can be realized quickly, with no capital investment. Independent Catalyst Test Report brings our clients the information they need to choose catalysts in a sensible way, for maximum profit.