Question 17: What considerations should you make when contemplating changing catalyst supplier from the original unit licensor?

LAMBIE (KBC Advanced Technologies, Inc.)

Changing catalyst suppliers is not an uncommon practice. It is done successfully in many different locations. Typically, cost and yield improvements are the most influential factors. However, there are some other key considerations before making the change. As far as the yields, it is important to review the catalyst's performance data, particularly of operating units, if at all possible. Also, consider the commercial experience: How many units are operating out there, and how well are those units performing? In some instances, it may be necessary to review pilot plant data in the scenario where you are considering installing a newly developed catalyst.

From a cost standpoint, we need to look at the overall catalyst replacement costs. Many times, that includes the precious metals' ownership or leasing arrangements that might be required, as well as any royalties from the original licensor and the new licensor. It is important to compare and contrast different quotes from multiple catalyst suppliers, if possible, which provides competition and helps drive down the costs. It is important to look at the total offering provided for each supplier, such as the startup and post-startup support, as well as any guarantees that the licensors are going to provide, such as any yield performance catalyst life or run length and/or any product specification guarantees.

One should look at the risks involved with changing the catalyst and have a backup plan in case it is not successful. Consideration of differences in procedures – whether operating, regeneration, or emergency – is important as well. It is also valuable to review any environmental or special handling requirements for the new catalyst. Almost as important as the cost and yields is the operator's knowledge and experience of his existing unit. Being familiar with all of the equipment, processes, and procedures is critical to ensure smooth transition from one catalyst to the next.

When considering changing catalyst, a refiner should be prepared for little or no support. This is not to say that there will not be any support; only that it may be limited, and refiners should be prepared for that. There are instances, as in the case of a CCR unit where there is proprietary equipment, when the new licensor will not be allowed to see that equipment and may not be able to support you. Similarly, an old licensor may stop supporting if a new catalyst is put in your unit. Having confidence in the unit operating staff to be able to adjust to the operation with a new catalyst will aid in the decision-making process.

DUNHAM (UOP LLC, A Honeywell Company)

Scott covered the question well with his answer. I want to add that this is a particular issue for the CCR because you are moving around catalyst. So, changing the catalyst can impact how it moves. You know the catalyst property. You know the size distribution and density. Everything will have something to do

with that.

It becomes a sensitive issue if you start to have problems with the unit. You may go to the licensor and ask, “Why are we not getting the performance we want?” They will come back and say, “Well, I cannot tell you because you have someone else’s catalyst in here. We think it is a catalyst problem.” So sometimes you get fingers pointing back and forth: “Well, it is the process.” “No, it is the catalyst.” The issue then becomes what is acceptable to discuss; because the catalyst guy cannot look at your drawings and see what the equipment looks like, and the equipment people cannot look at your catalyst analysis. So, it really does go back to whether your organization can fill these support roles that you may be lacking if you go away from the licensor’s catalyst.

RATHINA SABAPATHI [(Kuwait National Petroleum Company (KNPC)]

Our issue is specifically with regard to continuous catalyst regeneration. The cause originated from the CCR. We have a concern about how the regeneration will be done for the other catalysts with regard to regeneration temperature. Also, at what temperature will the agglomeration of the platinum happen? We do not have much knowledge about these issues, which we need in case we go to another catalyst vendor. Can you throw some light on that?

WARREN LETZSCH (Technip USA)

I would not buy a catalyst from someone if he could not tell me how to regenerate it in the unit in which it is being put. In other words, the supplier should be able to answer your questions if he has done all of the testing on the catalyst and is familiar with your operation. If he cannot answer questions like that and give you the support, I would be reluctant, if you will, to go ahead and buy that catalyst. But maybe someone else has a different opinion.

RATHINA SABAPATHI [Kuwait National Petroleum Company (KNPC)]

The source of this issue is that this regenerator is property specific to UOP, and we have an issue handing over those documents to them.

DUNHAM (UOP LLC, A Honeywell Company)

Well, you can run into a conflict here where UOP has specific procedures for regenerating the catalyst and operating limits associated with that process. There are temperature limits, and others limits such as chloride and oxygen, when you are doing regeneration. Now if your new catalyst vendor is saying, “These are my procedures,” and they conflict with the UOP procedures, then you may end up with some equipment damage. So you have to decide what you are going to do because we cannot help you.

[Laughter]

SHRIKANT MADHAV VAIDYA (Indian Oil Corporation Limited)

Recently, we had the experience of operating both kinds of CCR units. Our policy is that we do not limit ourselves to the licensor's catalyst alone. We have been getting decent service from whichever supplier sold us the catalyst. Before we decide to switch the catalyst or evaluate the option of both suppliers, the NDA (Non-Disclosure Agreement) is signed between the licensor and prospective supplier of the catalyst, and they must agree to provide all kinds of technical support. We have no problem with this arrangement.

SANJIV SINGH (Indian Oil Corporation Limited)

I do not have a question. I have an experience to share about another petrochemical unit of Indian Oil. We wanted to change out the catalyst. The new supplier is able to guarantee the yields' ex reactor, but he is not guaranteeing the final product for use. He says, "The downstream of the reactor consisting of purification section is not designed by me." Hence, by virtue of the lack of guarantee of the final product purity, we cannot buy a new catalyst from a different vendor that is not guaranteed; so, we are stuck with the original licensor catalyst.

DANIEL THOMAS (UOP LLC, A Honeywell Company)

I have a specific example of the conflicts and problems of troubleshooting when you have a license from one party and a catalyst from another. This is just reinforcing the statement that was made earlier. If you are comfortable troubleshooting your own unit completely, end-to-end, you will have a lot more flexibility than a refiner who does not have the experience to be able to troubleshoot the entire unit. If you have one technology licensor and a different catalyst vendor, the licensor cannot look at the operating data from the catalyst; so he cannot help you troubleshoot effectively. The catalyst vendor does not know the technical data or many of the limitations from the mechanical design, so he will also have difficulty doing troubleshooting. If you can troubleshoot your own unit end-to-end, then you will be fine. But if you do not have confidence to do that, it will be very, very difficult to troubleshoot a problem and determine the exact cause.

DUNHAM (UOP LLC, A Honeywell Company)

Going back to one other question: Have we ever signed agreements where we share information with someone else's catalyst fire?

DANIEL THOMAS (UOP LLC, A Honeywell Company)

To the best of my knowledge, no. Each catalyst vendor considers its own yield structure, densities, and information as proprietary and is very loath to share that with a competitor.

SCOTT LAMBIE (KBC Advanced Technologies, Inc.)

Changing catalyst suppliers from the original unit licensor requires a refiner to consider all implications. Typically, cost and/or yield improvements are the most influential factors affecting the decision to change catalysts. However, there are a several other factors that should be considered before making the change.

When evaluating yields, it is important to look at catalyst performance data, particularly of commercially operating units. When commercial data is not available, pilot plant data can be acceptable if the data is comparable to licensor reported commercial units. Refiners must evaluate the total offering from the alternate catalyst supplier(s). The offering should include the guarantees of the catalyst regarding the yield performance, catalyst life, and product specifications.

Differences in operating procedures should be reviewed, particularly regeneration for both semi-regenerative and CCR reformers, as well as water/chloride balance requirements. A review of emergency shutdown procedures required for the new catalyst, as well as any environmental or special handling concerns, should be evaluated.

The catalyst replacement cost should be competitive with the original licensor’s offering and have sufficient yield improvement to justify the change. The replacement costs should consider the ownership and/or lease arrangement costs of any precious metals. Royalties that may be imposed by the new licensor, as well as the original licensor, should be included in the analysis. When possible, compare multiple vendors to provide competition to help drive down costs. Refiners need to consider the risks of making the catalyst change and have a backup plan in case the catalyst change is not successful. A warrantee or guarantee helps alleviate this concern; but oftentimes, licensors are somewhat limited in catalyst change scenarios.

A very critical factor to consider before changing catalysts is the experience and knowledge of the refinery operating staff with regard to the operation of the unit and all of the process equipment, both externally and internally. When changing catalyst suppliers, particularly with CCR units, there are usually restrictions as to what the new catalyst supplier can see within the unit battery limits. Typically, the original licensor considers the equipment in the unit proprietary; and therefore, new catalyst suppliers are not allowed to enter the unit to offer assistance in troubleshooting if problems arise. New catalyst suppliers may attend the startup of the unit with the new catalyst but, in some cases, have limited access to information. The original licensor, in some instances, may stop support of the existing equipment and not offer to provide technical support when issues arise after the catalyst change to another supplier.

Having a strong operating staff knowledgeable of the process and all of the hardware and with the ability to provide the unit operation troubleshooting if/when issues arise is almost as important as the cost and

yield improvement of the new catalyst. Operations' knowledge and experience will ensure a smooth transition to operating with a new catalyst with minimal feedback or assistance from either the new or existing catalyst licensor. Many refiners have changed catalyst from the original licensor with success.

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