Proposal: Select Client Study


An Assessment of the Current and Short Term Impacts Over 2020-2022

May 2020
Table of Contents – Proposal


<table>
<thead>
<tr>
<th>Contents</th>
<th>Slide #</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Abstract</td>
<td>3</td>
</tr>
<tr>
<td>II. Background</td>
<td>4</td>
</tr>
<tr>
<td>III. Study Need</td>
<td>7</td>
</tr>
<tr>
<td>IV. Objectives of the Study</td>
<td>9</td>
</tr>
<tr>
<td>V. Scope and Methodology</td>
<td>10</td>
</tr>
<tr>
<td>VI. Proposed Study Outline</td>
<td>12</td>
</tr>
<tr>
<td>VII. Deliverables</td>
<td>13</td>
</tr>
<tr>
<td>VIII. TCGR Experience and Qualifications</td>
<td>14</td>
</tr>
<tr>
<td>IX. Order Form &amp; Secrecy Agreement</td>
<td>15</td>
</tr>
</tbody>
</table>

In this period of uncertainty due to COVID-19, this one-of-a-kind study will be critical for decision makers.
Abstract

The global catalyst business was ~$33 billion (USD) in 2019 and is served by over 100 companies with different corporate structures

- Structures vary from narrowly focused captive manufacturers to multiproduct multisite merchant suppliers, with or without process technology licensing activities
- More than 50% of this market is covered by only 10 Top players
- Beyond the Top 10, next tier participants act opportunistically and nimbly

COVID-19 is having substantial short-term and long-term market impact on oil/gas, other feedstocks and intermediate/final products

- Global consumption of petroleum products has fallen to its lowest level in decades induced by mitigation efforts for COVID-19
- Catalyst suppliers and process licensors are impacted significantly but differently in fuels, intermediate chemicals and final products

TCGR is uniquely qualified to assess COVID-19 impacts on the catalyst and process licensing industries, with 35+ years of industry experience, unparalleled experts and deep contacts. No other organization is as prepared and positioned.
Background

Critical to assessing COVID-19 impacts is an understanding of the structure and business models of Leading (Top 10 and Next Tier) players

Three critical factors:

(1) The Markets they Serve
- A range of exposures due to markets where they have focused/concentrated, polymers vs. environmental vs. refining vs. petrochemicals

(2) The Business Models they Follow
- A spectrum of vulnerabilities/opportunities
  - catalysts only; narrow/focused portfolio (e.g., Albemarle, Umicore)
  - catalysts only; broad portfolio (e.g., BASF, Clariant)
  - integrated catalysts and process licensing (e.g., Johnson Matthey, Haldor Topsoe, Honeywell-UOP, Grace, Shell Catalyst & Technology, SINOPEC)

(3) The Growth Strategies they Employ
- A variety of advantages/disadvantages as a result of their demonstrated growth strategies
  - organic growth (e.g., Haldor Topsoe)
  - growth by acquisition (e.g., Johnson Matthey, Grace);
  - restructuring via divestiture (e.g., Albemarle, BASF)

Beyond the Top 10, next tier companies such as PQ, LyondellBasell, Nouryon, Lanxess, JGC C&C and others will also be affected.

Table 1: Top 10 catalyst suppliers in 2017, sales revenue in USD million.

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Sales Revenue (USD million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson Matthey*</td>
<td>4,056</td>
</tr>
<tr>
<td>BASF</td>
<td>3,123</td>
</tr>
<tr>
<td>Umicore</td>
<td>1,413</td>
</tr>
<tr>
<td>Grace</td>
<td>1,250</td>
</tr>
<tr>
<td>Albemarle</td>
<td>1,067</td>
</tr>
<tr>
<td>UOP</td>
<td>1,080</td>
</tr>
<tr>
<td>Sinopec Catalyst</td>
<td>1,050</td>
</tr>
<tr>
<td>CRI/Criterion</td>
<td>1,030</td>
</tr>
<tr>
<td>Clariant</td>
<td>779</td>
</tr>
<tr>
<td>Haldor Topsoe</td>
<td>505</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>15,353</strong></td>
</tr>
</tbody>
</table>

* Fiscal year Apr. 2017/Mar 2018
**Background**

The timing, size and specific impacts from COVID-19 on catalyst suppliers and process licensors, structures and business models, will be based on the following critical factors:

1. **Market Exposure:** A range of exposures due to markets where they have focused/concentrated, polymers vs. environmental vs. refining vs. petrochemicals
   - Several of the majors are heavily focused on hard-hit oil refining and liquid fuels production; companies (e.g., Albemarle, Grace and Shell) will endure impacts from prolonged slow-growth markets.
   - Others participate more in petrochemicals/intermediates markets, which are less adversely affected than fuels, such as: catalyst suppliers for olefins and aromatics production (e.g., UOP-Honeywell and Clariant) and those serving chemicals derived from syngas (e.g., Johnson Matthey, BASF, Haldor Topsoe).
   - In the area of polymerization catalysts and process licensing, served by catalyst leaders (e.g., Grace and Albemarle, among others), may be expected to endure less pronounced impacts.
   - Environmental catalyst suppliers - for mobile and stationary emissions reduction (e.g., Johnson Matthey, BASF and Umicore) - will be negatively affected by reduced fuel/travel (both gasoline and diesel), although markets for stationary emissions (e.g., SOx, NOx, etc.) will remain steady.

**Model and Strategy Exposure are also Critical Factors...**
Background (continued)

The timing, size and specific impacts from COVID-19 on catalyst suppliers and process licensors, structure and business models, will be based on the following critical factors:

(2) Model Exposure: A spectrum of vulnerabilities/opportunities such as catalysts only; narrow/focused portfolio, catalysts only; broad portfolio, integrated catalysts and process licensing

- Participants with narrowly focused product offerings (e.g., Albemarle, Umicore) can expect impacts to affect not just sales, but also earnings and future expenditures (e.g., CAPEX).
- More diverse product portfolios (e.g., BASF, Clariant), and integration into process licensing (e.g., Grace, Johnson Matthey, Haldor Topsoe, UOP-Honeywell), provide diffusion/dilution of negative impacts, but additional exposure to investment decisions which are being delayed.

(3) Strategy Exposure: A variety of advantages/disadvantages as a result of their demonstrated growth strategies organic growth; growth by acquisition; restructuring via divestiture

- Participants pursuing organic growth models (e.g., Haldor Topsoe) face slower returns which are modestly offset by understanding customers’ needs. Those employing acquisitions (e.g., Grace) and/or restructuring/divestitures (e.g., BASF) are in strong positions with readily available financing while asset pricing is attractive.

As a result, distinguishing between winning/advantaged participants and those deemed risky/vulnerable in the COVID-19 period should lead to measurable impacts on participants and the competitive landscape.
COVID-19 world impact will create a new competitive landscape for catalyst producers and process licensors and it must be assessed so implications of the current “shut down” and forthcoming “new normal” can be highlighted and opportunities/threats quantified.

Catalyst end users can consider integration into providers (e.g., in order to ensure security of supply).

Venture capital and other financial institutions can re-assess investment returns.

It is clear that there are both opportunities and threats as a result of the uneven amount and timing of impacts from COVID-19.

What model and/or strategy is advantaged or vulnerable and why?

Source: Company annual reports and websites, author estimates.
The Need for the Study (cont’d)

The impacts from COVID-19 on industry participants will be manifest in different ways, each with implications on short-term operations as well as long-term viability, with concerns/questions over three horizons:

- **Immediate/short-term**: these include cash flows, ability to borrow, capabilities to retain key employees (both commercial and technical/R&D), resources to make and deliver products/services.
- **Medium-term**: these include the above, plus the ability to re-pay loans, potential remedial actions affecting supply chain, and decisions on CAPEX.
- **Long-term**: these include the above, plus the commitment to innovation/R&D which is a critical differentiator in catalysts/licensing.

✓ Catalyst end users can consider integration into providers (e.g., in order to ensure security of supply) and venture capital and other financial institutions can re-assess investment returns.

An encompassing view of the participant landscape of the industry’s Top 10 and next tier players reveals a certainty that there will be uneven disruptions with a range of opportunities as a result.
Objectives

TCGR’s objectives in completing this study are as follows:

- To delineate the implications of COVID-19 on the leading (Top 10 plus next tier) global catalyst producers and integrated process technology licensors.

- To quantify the impacts of COVID-19 on their operations, prospects and potential/likely actions affecting current/future business models and growth strategies.

- To specify the timing, volume/value and competitive/strategic implications of COVID-19 on the participants, with insights for decision-makers.

In a period of such uncertainty brought on by COVID-19, it is critical that a timely assessment of opportunities and threats be completed; TCGR is uniquely positioned to do so.
Scope & Methodology

By delineating the implications of COVID-19, TCGR will quantify impacts to business models and growth strategies on the leading (Top 10 plus next tier) global catalyst producers and integrated process technology licensors.

The study will address such topics as:

- Which catalyst producers and/or integrated process technology licensors are concentrated in markets/segments hardest-hit by COVID-19? Which competitors may remain unscathed?
- Which characteristics in model and strategy are most impacted and which companies are employing those models/strategies?
- What early signals will the participants demonstrate in their model or strategy to reflect their position of strength/weakness or advantage/disadvantage?
- How do pre-COVID-19 metrics of size, growth, profitability, and upstream/downstream integration affect participant’s next steps?
- To what degree are recent or planned expenditures impacted and what are the implications on model/strategy going forward?

TCGR will focus its analysis on the 2020-2022 period with particular attention on Q2-Q4, 2020
Scope & Methodology (cont’d)

In addressing the questions on the previous page, TCGR will use its exclusive catalyst/licensing industry model, its DIALOG GROUP® experts, and its in-house experience from 35+ years in the industry.

Specifically, TCGR will:

• Leverage its soon-to-be completed biennial catalyst industry report, the “gold standard” for participants and investors alike, entitled *The Intelligence Report: Business Shifts in the Global Catalytic Process Industries, 2019-2025*

• Expand, update and re-assess its two “Special Feature” articles in *The Catalyst Review* entitled *Catalyst Business: Different Business Models Under Scrutiny*

• Incorporate inputs and guidance, both technical and commercial/strategic, from experts in catalyst development/R&D, business operations (including production and technical service) and strategy/M&A

The select-client study will provide an insightful analysis “for the industry, by the industry” with actionable guidance on both competitive and strategic levels.
Proposed Study Outline


I. Background

II. Executive Summary

III. Assessment: Markets Served Advantages/Vulnerabilities
   E.g., three market impacts including negatively affected (fuels); moderately affected (olefins, aromatics); positively affected (plastics)

IV. Assessment: Model Advantages/Vulnerabilities
   E.g., three models including focused, broad and integrated

V. Assessment: Growth Strategy Advantages/Vulnerabilities
   E.g., three strategies including organic, acquisition and restructuring

VI. Assessment: Industry Response
   E.g., three analyses including technical, commercial and strategic

VII. Conclusions and Recommendations
**Deliverables**

The study deliverables will be the following:

- 30-40 PPT slides
- 1-hour client-specific conference call to review highlights and address questions

Delivery is expected within 6-8 weeks of study launch.

Fees at the “charter” (pre-launch) level are $5,500; after launch fees are $8,500.

All subscribers to TCGR’s *Intelligence Report: Business Shifts In The Global Catalytic Process Industries, 2019-2025* are entitled to a $1,000 discount off the subscription price.

**Charter Subscriber Benefit**

As is the case with all TCGR offerings, additional benefits are provided to “charter” subscribers (i.e., those that sign-up prior to study launch) in that they have the opportunity to work with TCGR to further refine the scope of the report by delineating areas of particular interest, notably in Sections III – V (per the preliminary TofC on slide #12).
TCGR Experience and Qualifications

- TCGR will leverage its access to chemicals experts that have >35 years’ industry experience via its DIALOG GROUP® (a mixture of commercial and technical) in completing this study.

- TCGR will utilize publicly available and in-house information to complete the deliverables as well as technical/commercial literature reviews, company-specific financial releases, in-field interviews and its proprietary model.

- TCGR Dialog Group® experts have deep experience in the required technology from a process technology, catalyst technology and market size/growth application perspective.

The Catalyst Group Resources has covered related technical process advancements in similar reports; those can be seen here on our website. Other advancements are also tracked as part of our Catalytic Advances Program and CO₂ Capture and Conversion Program.

The DIALOG GROUP® is a renowned group of industry-leading experts that provide key intelligence and analysis of the fuels and chemicals industries.
Please enter our order COVID-19: Impacts on Business Models and Growth Strategies of Catalyst Producers and Integrated Process Licensors to be completed in June/July 2020, as follows:

__________ COVID-19: Impacts on Business Models and Growth Strategies of Catalyst Producers and Integrated Process Licensors as a “charter” subscriber $5,500 (US $8,500 after study launch) to be delivered as a PDF file containing PowerPoint slides, which includes use across locations (i.e. site license). Subscription also includes 1-hr Q&A session.

__________ We are subscribers to TCGR’s Intelligence Report: Business Shifts In The Global Catalytic Process Industries, 2019-2025 and are therefore entitled to the $1,000 discount off the subscription price.

In signing this order form, our company agrees to hold this report confidential and not make it available to subsidiaries unless a controlling interest (>50%) exists.

Signature: __________________________________________________________________________ Date: __________________________

Name: ___________________________________________________________________________ Title: __________________________

Company: __________________________________________________________________________

Billing Address: __________________________________________________________________________

City: __________________________________ State/Country: __________________ Zip/Postal Code: ____________

Phone: __________________________ E-mail: __________________________ Purchase Order No. __________________________ (if required)
Additional Information and TCGR Contact Details…

**The Catalyst Group Consulting (TCG)**
For more information, contact:

Clyde F. Payn  
Chief Executive Officer, TCG  
CPayn@catalystgrp.com  
+1.215.628.4447

**The Catalyst Group Resources (TCGR)**
For more information, contact:

John J. Murphy  
President, TCGR  
John.J.Murphy@catalystgrp.com  
+1.215.628.4447

P.O. Box 680 • Spring House, PA 19477 • U.S.A  
ph: +1.215.628.4447 • fax: +1.215.628.2267  
www.catalystgrp.com