Engineering Consulting & Training Services

CARMAGEN Engineering, Inc.

eNewsReport

July 2011

Competitive Technology Intelligence (CTI): Surveying the Competitor Landscape

By George A. Swan III, Ph.D., P. Eng.

An important element of good business plans is knowledge of the competition, not only their current operations but also probable future trends. This is particularly relevant for the refining and chemical process industry where technology evolution is critical to improving profitability. Benchmarking against the competition provides a basis for key investment decisions, but benchmarking is often a formidable task since the required information is not easily accessible. However, over 90% of valuable competitor technology insights may be found in the public domain; the challenge is to collect "intelligence" from multiple sources and then fit the pieces of the puzzle together to create a unified picture of the competitor landscape.

A primary source to exploit is patents and published patent applications. A focused search of U.S. and foreign patent databases for a specific technology area typically yields a vast number of "hits" which must be categorized and analyzed. The search protocol itself is developed through an iterative process and refined as necessary to ensure the target technology is effectively captured (i.e., is a known patent family included in the search output?). Then analysis is facilitated by commercially available computer software which handles the taxonomy and provides visualization of results (e.g., inventor and corporate assignee intensity) suggesting trends or patterns as well as potential gaps. Complementary to computer-aided patent mapping is technical review of higher interest patents to assess their merits and relative importance. A computer-generated report on the IP arena identifying key players and growth patterns, combined with technical assessment of the patent art, provides the framework for a "SWOT" (Strengths-Weaknesses-Opportunities-Threats) analysis. Here the emphasis is on how internal IP compares with the competition and where gaps may exist for commercial exploitation.

A second valuable resource is publications, encompassing scholarly journal articles, conference presentations, and even trade association proceedings. These may be included with patent analysis to provide an integrated product, since some software packages handle both patents and publications simultaneously. Other potential but often overlooked CTI sources are company filings with federal or state regulatory agencies. Permit applications for a plant expansion may provide valuable information on technology being deployed which, when integrated with patent and published disclosures, can help complete the competitive picture.

Another lucrative CTI source is professional meetings and their associated receptions and hospitality suites. The approach should not be ad hoc, but rather a concise advance plan is recommended to formulate questions whose answers would fill the remaining gaps from patent and publication analysis. The goal is to verbally acquire non-confidential information on a specific

Work Highlights

Process, Operations & Safety

Established a consultation helpdesk liaison arrangement to assist a licensor to promptly address specific FCC questions/issues received from their clients. This has involved five separate refineries overseas so far, with potential to expand.

Supporting PIMS simulation modeling and refinery optimization remotely on various ongoing projects.

Continue to provide facilitator and designer support on numerous HAZOP, project safety review, and Transient Operations HAZOP (TOH) efforts at many locations.

Project Management

Participated as a team member in performing a Cold Eyes Review of the planned completion schedule of a major petrochemical project located in the Far East. Several areas of possible improvement were identified.

technology which is qualitative at best but serves to validate previously identified trends such as level of corporate activity, stage of development, and deployment outlook. In that regard, conversations with catalyst vendors and corporate technology sales personnel often result in nuggets of complementary information which, when considered in the overall context of IP assessment, can lead to better understanding of the pace of technology advancement. The valued-added business goal of CTI is *to predict the trajectory of competitors' IP* vs. a current snapshot of their proprietary technology and operations.

The following hypothetical example based upon an actual case illustrates how CTI methodology can be employed for redesign of feed nozzles in advance of an FCCU turnaround. The overarching objective is to modify the existing nozzles to provide more effective utilization of dispersion steam, reducing steam consumption by up to 50% without incurring degradation of the oil spray in the injection zone. Based upon some scoping studies, the best lead to achieve this may be adding high velocity steam jets to impact oil upstream of the outlet atomizing orifice. Mechanically the conventional steam sparger or mixing tee would be replaced by a series of small steam orifices to increase kinetic energy of the steam/oil mixture and thereby improve atomized oil dropsize distribution. Given this general concept, the next step is to survey competitive FCC feed injector technology and determine whether there might be a window of opportunity for proprietary development and deployment of this lead in a pioneer FCCU application.

The most cost effective approach is to purchase a software package to mine worldwide patent and publication databases in the areas of "FCC feed injectors" and "heavy oil atomizers." There are several choices of IP software on the market with price range dependent upon desired power of the analysis tools. Several iterations are typically needed to close on the search terms for title and abstract. Optionally, corporate applicants and inventor names may also be included in the search. It is important to get this right, since patent or publication records not identified in the broad search will be excluded from analysis. For this example, a relatively inexpensive IP software program was deemed adequate, although it was limited to patents only. When the file list of U.S. and foreign patents and patent applications for FCC feed injectors was generated, a review of the output resulted in elimination of a significant fraction of the total hits as being irrelevant for this survey. The "analysis" feature of the software program was then employed to sort and classify the retained patents and to generate graphical representations of the results. Figure 1 is an overall patent activity chart showing key corporate players in the FCC feed nozzle development space.

While Company A has a commanding lead in obtaining patent coverage on feed nozzle hardware and orientation in the injection zone, the mechanical design disclosed in two of Company B's patents is actually closer to the envisioned steam addition orifices for redesign of the FCCU feed nozzles. Further insight is provided in Figure 2 which tracks the yearly granting of patents to these competitor companies.

A key conclusion from this matrix is the lack of recent patents awarded to Company B, suggesting this is no longer an active area of technology development. On the other hand, Company A and perhaps to a lesser extent Company D continue to evolve their feed injection technology. More detailed analysis of Company A's patents granted since 2005 confirm this to be the case. An unknown at this point is whether Company B applied their patented injector design in FCC units.

The two Company B patents that would likely dominate the planned nozzle modifications are within a few months of their expiration dates, suggesting that a potential licensing fee covering post-turnaround FCCU startup and operation would be minimal. A patent attorney should be consulted to determine the best course of action going forward. A key question is whether to expedite filing a provisional U.S. patent application on the actual mechanical nozzle design to be installed. The attorney will probably also recommend an independent freedom of operation study to ensure that within this crowded art area there are no other patents which need to be considered prior to implementing the new design in the plant.

A CTI action plan should be considered. Confirmation of the breadth of application of Company B's nozzle design would provide insight into its potential economic benefits. The initial step of integrating patent and publication analysis suggests their disclosed nozzle is likely an element of Company B's FCC licensing package. Hence the next step would be non-confidential verbal contacts using a systematic Q&A approach to fill the knowledge gaps and determine incentives for improving upon the basic design. Also, since Company A continues to be aggressive in obtaining patent coverage for feed injection hardware, projecting their future technology direction would be important for benchmarking competitiveness. Even with software programs to facilitate analysis, CTI is both challenging and manpower intensive. The CTI final report is valuable nearer term for strategic technology planning and longer term as a framework for delivering competitive advantage.

The foregoing example is a relatively simple application of CTI methodology. Typically the focus will be on a broad technology area to assess competitor trends and facilitate development of a suitable response for internal business plans. In such cases, the patent and publication searches generate several thousand "hits" which are subsequently analyzed using powerful computer software that creates charts and maps to guide evaluation and

help identify subtle inter-relationships which might otherwise go undetected. Based upon these findings, a systematic CTI plan may be devised to gather further intelligence from targeted sources. This information is key to resolving uncertainties identified during the analysis phase and usually is the final step toward synthesizing the overall competitive picture. The CTI process is dynamic; searches must be updated periodically and their output added to the analysis database to ensure the most current data are employed to track competition and adjust projections of their future direction.

Figure 1

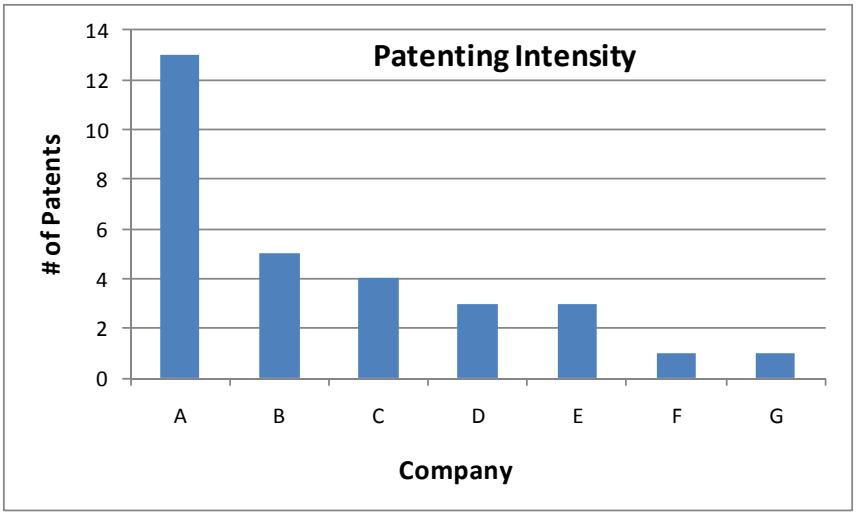

Figure 2: # Patents to Corporate Applicants by Year

Company	A	B	C	D	E	F	G
1987		1					
1989					1		1
1992	1	1	1		1		
1993		1					
1997					1		
1999		2					
2000	1		1				
2001	3						
2002	2		1				
2003	1		1				
2005				1		1	
2006	2			1			
2007	1						
2008				1			
2009	1						
2010	1						

About the Author

George Swan, III has over 40 years experience as a Process Development / Process Research chemical engineer specializing in innovative engineering solutions and profit opportunity identification, novel process conceptualization, technology development and deployment strategies, and intellectual property formulation and management.

Please contact Jerry Lacatena (jlacatena@carmagen.com) if you'd like more information on Carmagen's expertise in this area.