The Chronology of Powell Circuit Breakers

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Powell began manufacturing medium voltage vacuum circuit breakers about 40 years ago. This technical brief deviates from the normal singular technical topic format to capture the bare essence of the metamorphosis of Powell from OEM to full-fledged circuit breaker manufacturer.

Milestones mark the path of any journey. For Powell Industries those milestones include the introduction of the prepackaged substation concept named the Power Control Room (PCR) in the 1970's, the PowlVac circuit breaker in the 1980's and the introduction of Arc Resistant medium voltage switchgear in the 1990's.

Since its introduction the PCR revolutionized the industrial substation market to the extent that every major supplier of electrical equipment to that market has mimicked the concept. Unlike site-built brick and mortar powerhouses of the past, the PCR is a completely integrated substation that is designed, fabricated, constructed and functionally tested as an assembly in a factory environment. Once shipped to the user's site it essentially becomes a "plug and play" installation, which greatly reduces start-up time and expense. The shipping sections are set in place and assembled leaving essentially only the required field control and power cabling to be installed and tested prior to energizing the substation.

The heart of many PCRs is medium-voltage metal-clad power circuit breaker equipment. Until the 1980's the circuit breakers were air-magnetic designs that were mostly supplied by General Electric and Westinghouse, and to a lesser extent by ITE. The metal-clad equipment was constructed using purchased OEM draw-out components and assemblies as the basis. The switchgear was then customized per order and fabricated according to user specifications. The size of the air-magnetic circuit breaker limited these designs to only one power circuit per vertical section.

The limitation of one power circuit per vertical section began to change in the late 1970's with the introduction of vacuum interrupter technology by General Electric (GE) with the Power Vac vacuum circuit breaker. With the reduced size of the vacuum circuit breaker as compared to air-magnetic circuit breakers, the Power Vac could be stacked one above the other in a single vertical section. This innovation not only introduced a better method of interrupting medium voltage current, but also doubled the power circuits that could be served by the same footprint of the air-magnetic designs. This greatly reduced the required floor space and cost per circuit of the equipment line-up.

Ostensibly due to the lack of significant field experience of this new design, Power Vac circuit breakers and compartment components were not immediately made available to OEMs such as Powell. This put all OEMs at a distinct disadvantage in the marketplace. In short order a similar design produced by California based Howe-Yin Manufacturing came to market and was made available to OEMs. However, this design did not offer 5kV 350MVA or 15kV 1000MVA ratings, or any 3000A continuous current ratings, which were a significant portion of the ratings required by Powell's predominately petrochemical customers.

High level negotiations to secure a supply agreement between Powell and GE were not successful. Not to be held hostage in the marketplace and true to Powell's core entrepreneurial spirit, the decision was made to begin developing what was soon to be known as PowlVac circuit breakers and metal-clad switchgear. PowlVac design efforts began in 1979.

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The first PowlVac equipment was shipped in 1982 to Amoco Oil in Texas City, TX. Field trial results were excellent, which helped to both boost confidence in the new design and gain acceptance from other oil and gas customers in the region. Bolstered by Powell's "Can Do" attitude, outstanding field service and support, the Powell Vac design quickly gained acceptance throughout North America.

PowlVac circuit breakers were initially offered with ratings of up to 15kV, 1000MVA, 3000A. Heavy bulk-power users quickly pushed that limit, which led to the introduction of a 4000A force-cooled design in 1997.

The robustness and adaptability of the design led to the introduction of the PowlVac ND design in 2001. The ND was targeted at the 5kV market which was historically configured in a narrower design, typically 26 inches wide. In contrast 15kV equipment is typically a 36 inch wide design. As 5kV air-magnetic designs became obsolete, the narrow design enabled replacement of the obsolete equipment within the same floor space.

For practical reasons higher voltage, lower current solutions were becoming sought after by these same users. Reverting to Powell's OEM roots, this need was met by using 27 and 38kV circuit breakers and components supplied mostly by Fuji and Adda; with Adda subsequently becoming ABB SACE. Being primarily IEC designs for the European markets, these designs presented difficulties adapting them to the operational and ratings requirements of the North American market.

In 1993 Powell purchased the Ultra-Compact circuit breaker product line from IEM in California with the expectation that this design could quickly be expanded to include 38kV ratings more suited to the market.This led to the development of the PV38 design, which included 38kV, 40kA, 1200 and 2000A vacuum circuit breaker and equipment ratings.

During the same time period in the 1990's, Powell was urged by two well respected local petrochemical clients to develop new metal-clad switchgear design concepts, known as arc-resistant to the European and Canadian markets.. Powell undertook the challenge beginning with PowlVac metal-clad switchgear. There being literally no knowledge base for these designs to draw from, after some trial and error the effort was successful and the first arc-resistant switchgear platform offing this capability in the US introduced. Since that time, this optional construction concept has migrated into many other metal-enclosed medium voltage products Powell manufactures, and also includes low-voltage metal-enclosed power circuit breaker switchgear products.

Many years after being denied OEM access,Powell purchased the Power Vac circuit breaker and metal clad switchgear product line from GE in 2006. This equipment is now completely manufactured at the Houston Texas Airport facility and continues to serve the utility, light industrial and commercial markets well.

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As stated earlier, this is nothing more than the bare outline of the story in order the fit the confines of the Technical Brief format. The story of the transformation of Powell from circuit breaker OEM to manufacturer is obviously much longer than this and is full of trials and tribulations. A much expanded version of this Technical Brief, delving into the good, the bad and the ugly parts of the story is being planned for the relatively near future. Stay tuned!

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