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Reconsidering PVC window frames (1975–2000). Technological advancements and commercial strategies

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Abstract: In the wake of World War II, plastics, particularly polyvinyl chloride (PVC), emerged as key innovations. PVC window frames, a prevalent application of PVC in construction, experienced a surge in Western Europe during the 1970s. This growth was driven by the unique context of oil crises and was further propelled by the desirable thermal properties, cost-effectiveness, and low maintenance requirements associated with PVC windows. Despite their numerous advantages, plastic components, including PVC window frames, have often faced criticism or been overlooked.

This paper challenges the prevailing criticism directed at PVC window frames by delving into the technological advancements that this product underwent between 1975 and 2000. By examining advertisements, we aim to uncover aspects beyond mere technology, illustrating the relevance and resilience of PVC window frames within construction, as well as the remarkable adaptability of PVC window frame manufacturers in response to the ever-evolving market dynamics. Furthermore, our study transcends the component level to offer a broader perspective on the evolving building culture. This includes an exploration of the notion of specialization within production industries and the transition towards high-tech production processes and materials. The study draws from product catalogues by window frame manufacturers, advertisements and articles in contemporary construction journals, as well as publications by scientific organizations and institutes for vocational training, to enable a variegated perspective on the topic within its wider architectural and construction context.

Introduction

The evolution of plastics, particularly in the aftermath of World War II, marked a significant milestone in the field of materials science and production. The scarcity of rubber during and after the war spurred a remarkable development in synthetic rubbers. With the pervasive presence of plastics in various industrial sectors, also the construction industry witnessed a profound transformation, as plastics began to find their application in essential building components. Notable examples from the post-war era include the introduction of polyvinyl chloride (PVC) pipes for plumbing and electrical systems, plastic roofing sheets and, starting from the 1950s, the use of plastic in window frames. Several factors contributed to this widespread adoption of plastics in construction. The 1950s to 1970s witnessed a period of low oil prices, which favored the production of plastics. Their adaptability in terms of shape and their potential for optimizing material properties further enhanced their appeal. This technological advancement in plastics persisted beyond the 1970s, manifesting in areas such as sealants, insulation films, extrusion of window frame profiles, and the recycling and reutilization of plastics (Bot 2009, 175–176). (Fig. 1) However, the ubiquity of plastic components, often mass-produced and widely employed in the built environment, led them to be perceived as somewhat banal, akin to the multitude of finishing materials that characterized the latter decades of the twentieth century. Nevertheless, these plastic components hold valuable narratives of an era driven by technological

Figure 1. PVC window frames in 1980s Brussels residential architecture (photo *Bouwen met baksteen* 48, no. 3 (1987)).

progress, especially within the petrochemical industry (Monin 2020).To date, research on historical applications of plastics predominantly centers on (the conservation of) museum artifacts, gallery collections, and interior furniture, leaving a noticeable gap concerning plastic building components (Shashoua 2012, 37–41). Similarly, historical and restoration studies related to plastic applications in construction have mainly focused on pioneering projects, such as the military radar geodesic domes by Buckminster Fuller (1954) and the Futuro houses by Matti Suuronen (1968), both constructed with glass fiber-reinforced plastics (Engelsmann, Spalding, Peters 2010, 10–13; Docomomo Journal 2022). In contrast, the more common applications of plastics in construction, like PVC window frames, have received little attention, or even faced negative scrutiny. PVC window frames, in particular, have been criticized within architectural circles for their perceived lack of style, quality, and an overall mundane or cheap reputation compared to timber and aluminum counterparts. This criticism is exacerbated in conservation practice, where the use of PVC frames in renovation projects is often deemed as "inappropriate" and "completely out of keeping" with the design and character of historic buildings (O'Dywer and Roche n.d., 6–7). Some municipal authorities, like those in the Brussels-Capital Region, actively discourage the use of PVC frames due to concerns about their environmental impact during production and disposal (Dienst Stedenbouw gemeente Watermael-Bosvoorde n.d., 6–7).

Nonetheless, this paper contends that these critical assessments need to be balanced with an objective evaluation of PVC window frames, considering their inherent merits rather than being clouded by (aesthetic) biases. In this paper, we reconstruct the rise and fall of PVC window frames between 1975 and 2000, with a particular focus on their early-phase development and market presence, technological advancements within the construction industry, as well as marketing strategies. By doing so, this paper challenges the prevailing perception of PVC window frames as mundane and positions them as highly significant components of their time, deeply intertwined with socio-economic conditions. Therefore, this paper serves as an invitation to investigate common and seemingly cheap building components and products, recognizing their pivotal role in the day-to-day building practice and building culture.

This paper primarily draws upon the systematic examination of product catalogues published by window frame manufacturers between 1975 and 2000. Furthermore, advertisements pertaining to PVC window frames were rigorously analyzed from two Belgian architecture and construction periodicals, i.e. *A+: architectuur, stedenbouw, design* (1973–today) and *Nieuw/Neuf* (1965–2003). While the first primarily caters architects, urban planners and designers, making it an invaluable resource for tracking the preferences and trends within the professional architectural community, the latter targeted a wider audience of construction professionals. While advertisements provide valuable insights into the marketing strategies deployed by manufacturers and trends of the considered period, they may not always reflect the complete picture of a product's performance or reception in the market. They are carefully manipulated by an industry determined to expand its market. Therefore, the research also builds on publications by scientific organizations and institutes for vocational training such as the Brussels Building Research Institute (now Buildwise) and the Fonds voor Vakopleiding in de Bouwnijverheid (now Constructiv), as well as articles on architectural and construction trends in the architectural journals A+, *Nieuw/Neuf* and *Beter (ver) bouwen* (1983–2015) in order to gain a more comprehensive understanding of the historical context.

1. The emergence of a high-tech building product

Although the invention of PVC dates back to the nineteenth century, the material only gained significant momentum from the mid-twentieth century onwards. Several successive transformations underscore the dynamic and specialized nature of the PVC window frame sector, characterized by both technological sophistication and evolving production dynamics. Subsequently, from the 1970s onwards, the intricate play of energy crises, thermal efficiency, and significant promotional campaigns resulted in an increasing market share.

1.1. From PVC inception to a specialized industry

While the discovery of PVC traces its origins to 1838, its mass-scale production did not commence until 1938, due to the involvement of the companies Goodrich Chemical and General Electric (Bot 2009, 185–186; Kottas n.d., 12). Following the substantial expansion of plastics in the 1950s, the German company Dynamit Nobel AG ushered in a new era by pioneering the production of the first PVC window frames in 1954, on the basis of Mipolamelastic PVC (Constructiv 2003, 17; Trocal 1986; Barth, Hundertmark and Keller 1995, 100). Notably, these early profiles portrayed PVC in a secondary role, primarily serving as a protective enclosure for steel and aluminum profiles. (Fig. 2) The use of soft PVC (pPVC) with plasticizers for this purpose marked an initial strategy in the development of PVC profiles (Kunststoff museum Troisdorf 2021).

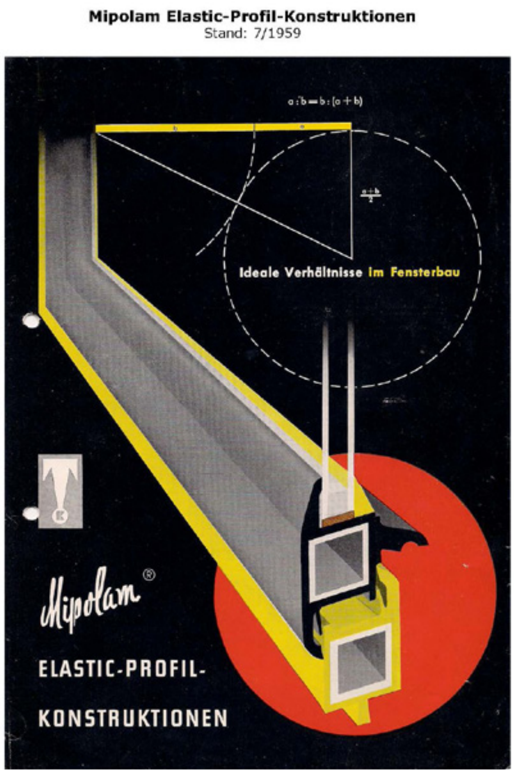

Figure 2. Mipolam Elastic profile system of 1959 (kunststoff museum troisdorf 2019).

A pivotal transition unfolded in 1959, as the industry introduced self-supporting window profiles made from unplasticized PVC (uPVC). German chemical companies started to engineer unique uPVC profiles from specific PVC compositions (Barth, Hundertmark and Keller 1995, 100). The various PVC compositions exhibited distinct characteristics, including variations in impact resistance and weathering performance (Titow 1990, 477). This capacity to modify the composition to optimize the material characteristics of PVC and other plastics represented a significant advantage, leading to subsequent innovations.

In the 1960s, the sector witnessed a significant transformation as window manufacturers initiated closer collaboration with the plastics industry. This shift saw the evolution of profile design, which began to intricately align with the inherent characteristics of PVC. This transformative approach extended beyond profiles, to holistic designs of entire window systems (Barth, Hundertmark and Keller 1995, 100). The evolving complexity of window frames prompted certain system developers to narrow their focus, concentrating solely on the design and testing of these systems. This reconfiguration epitomizes the industry's progression towards specialization and the segmentation of the production chain, emblematic of the high-tech nature of PVC window frames.

Within this intricate production landscape, a network of contributors emerged, encompassing PVC polymer producers, manufacturers of PVC compositions, extruders, assemblers and installers, with some entities engaged in multiple facets of production. For instance, major PVC polymer producers typically also manufactured PVC compositions, and in some instances also extruded profiles (Titow 1990, 16–17). This segmentation was further accentuated by the growing demand for PVC window frames, necessitating increased production capacity. Simultaneously, increased quality requirements and the industry's heightened focus on professional training underscored the commitment of system developers: they not only designed and tested systems, but also played a vital role in training and supporting the companies involved in the assembly of window frames.

1.2. PVC's market expansion: energy efficiency as the catalyst

In the late 1950s and 1960s, PVC window frames remained at the fringes of the construction industry, with their widespread adoption in buildings delayed until the 1970s (Van de Voorde, Bertels and Wouters 2015, 252–293). The subsequent rise can be predominantly attributed to the oil crises of the 1970s, which compelled a concerted effort to enhance energy efficiency. PVC emerged as a key element due to its good thermal insulation properties, particularly when contrasted to other materials like aluminum. Notably, PVC window frames not only offered superior thermal characteristics but also boasted minimal maintenance requirements in comparison to timber counterparts (Gosden 1981, 161; Pfeifer 1983, 136).

The increased market share is evidenced in 1982, when the International Energy Agency, as part of their Energy Programme, conducted a comprehensive study to gauge material preferences for window frames in several European countries, including Belgium, Germany, the Netherlands, and Switzerland (The International Energy Agency 1986, 3–5). The survey unveiled that synthetic materials, primarily PVC, had gained substantial popularity in Germany and Belgium, with market shares reaching approx. 40% and 25%, respectively. (Fig. 3) This established PVC as the second most favored frame material, following timber. However, the adoption of PVC windows remained limited in other countries, such as Switzerland (approx. 15%) and the Netherlands (less than 1%), where timber remained the dominant choice. Interestingly, in the realm of retrofit applications, the use of PVC window frames witnessed wider acceptance. In Germany, PVC secured its undisputed leadership as the preferred retrofit frame material, constituting approx. 60% of the market. In Belgium, it maintained its second-place position, but with a notably high market share of approx. 40%. This increase can be partially attributed to government-driven financial incentives, including the introduction of a tax benefit by the Brussels government in 1981 for replacing existing window frames with more thermally efficient ones (Regie pour l'aménagement de l'agglomération de Bruxelles. n.d.). However, the higher share in the retrofit sector can also be ascribed to homeowners being the primary-decision-makers, driven by their motivation to curtail energy consumption and maintenance costs.

The surging demand for PVC window frames in Belgium might also be attributed to an intensive promotional campaign for PVC-based solutions. An examination of advertisements for window frames published in Belgian architectural journals A+ and *Nieuw/Neuf* during the period 1975–2000, revealed a distinct trend in favor of PVC. Approx. 50% of the 80 different advertisements were related to plastic frames, with over 85% of them specifically promoting PVC. In contrast, aluminum frames were promoted in 30% of the advertisements, with the remaining 12% and 8% selling composite and timber frames,

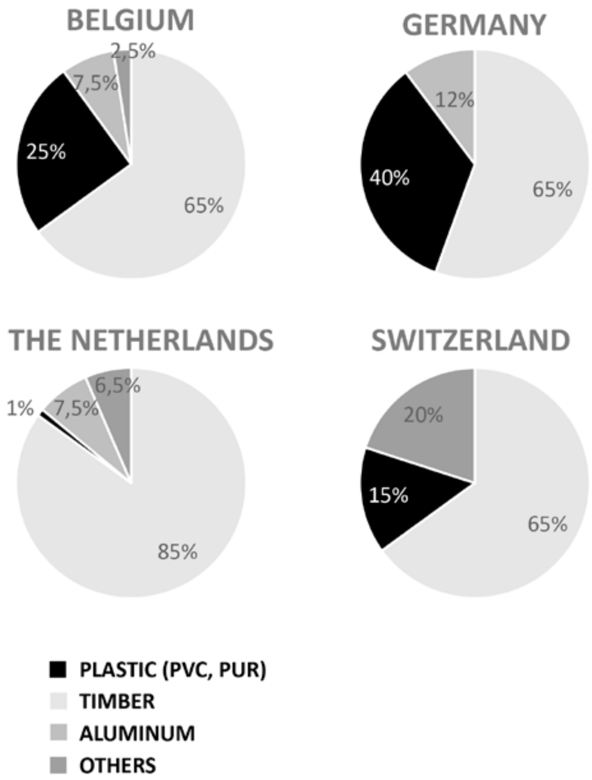

Figure 3. Graphic representation of the main materials used for window frames in new residential construction in Belgium, Germany, the Netherlands and Switzerland in 1982 (author 2023).

respectively. Among the major advertisers in PVC window frames, companies such as Kömmerling, Trocal, Vekaplast, Deceuninck, and Rehau featured prominently, underscoring the dominance of German system developers in the West-European window frame market.

2. Advancements in PVC window frame technology

The initial PVC window frames from the 1960s were relatively rudimentary, primarily featuring white, single-chamber profiles (Barth, Hundertmark, and Keller 1995, 100; Pfeifer 1983, 136). However, these early iterations have since undergone substantial enhancements. The growing specialization and segmentation within the production chain instigated technological advancements across several domains. In the following section, we will investigate four key technological advancements that transpired between 1970 and 2000, focusing on the enhanced geometry, PVC's pivotal role in advancing energy efficiency, increased complexity and innovations in coloring techniques. These technological advancements not only improved the overall performance of PVC window frames in multiple dimensions, but also increasingly accentuated the material's distinctive properties.

2.1. Balancing robustness and aesthetics

In the early stages of PVC window frame development, the inherent low stiffness of PVC profiles resulted in robust frames. That robustness came at the cost of reduced incoming light and made PVC unsuitable for restoration projects where faithful replication of the original geometry was imperative (Trocal 1986).

Addressing these challenges, two pivotal innovations emerged, each aimed at improving the performance of PVC window frames. These innovations, experimented with as early as the 1960s, centered on the incorporation of metal stiffening elements and the number of chambers or cavities within the profile. Notable examples of early implementations included the Kömmerling Combidur window frames introduced in 1967, which featured stiffening elements but only one chamber. Additionally, Overpelt introduced window frames in 1968 with multiple chambers but lacked stiffening elements. These early attempts yielded profiles with a thickness of 4 mm (referring to the thickness of the material surrounding the hollow chambers) and a total height (comprising both fixed and opening parts) of approximately 125 mm. (Fig. 4)

Subsequent development and refinement of these principles resulted in profiles with reduced thickness and total height. For instance, in the mid-1980s, Deceuninck introduced the “mini” series and Trocal introduced the “serie 460”, both featuring profiles with a reduced thickness of 2.5 mm and a total height of around 105 mm (Deceuninck Plastics Industries 1989, 154; Trocal 1986). Notably, this total height was comparable to that of certain aluminum window frames of the same period, such as the Thermo System 64 by Reynaers in 1986–1987 (Reynaers 1986–1987).

2.2. Maximizing thermal insulation through chambers

The introduction of chambers was a pivotal development that significantly enhanced both the stiffness and the thermal insulation capacity of PVC window frames. (Fig. 4) PVC inherently exhibits favorable insulation properties. According to the Belgian standard NBN 62–001 (1974), a vertical PVC wall with a thickness of 3mm displayed a thermal transmission coefficient of 5.65 W/m²K. To put this in context, oak wood possessed a coefficient of 5.87 W/m²K, while aluminum boasted 6.25 W/m²K. Increasing the number of chambers to enhance thermal properties was not unique to PVC window frames but was also observed in the realm of aluminum window frames. Consequently, by the close of the twentieth century, window frames featuring two or three chambers had become the prevailing standard.

When comparing the thermal insulation properties of early PVC window frames to those at the century's end, a nuanced assessment is required, given that calculation methodologies were still evolving during this period. For instance, in Belgium, the first standard pertaining to the calculation of heat transfer coefficients for windows was not introduced until 1987 (NBN B 62–002). Earlier calculations primarily focused on the glazing aspects. However, it is noteworthy that, by the end of the century, the average

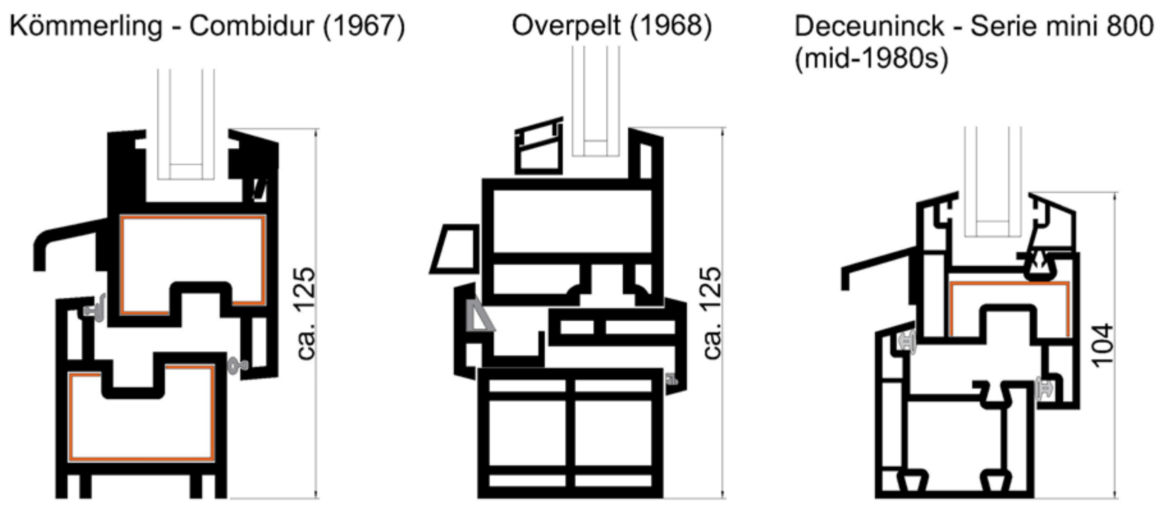

Figure 4. Evolution of PVC window frame sections from (left) single chamber with stiffening elements and (middle) multiple chambers without stiffening elements to (right) multiple chambers and stiffening elements (author 2023).

thermal characteristics of PVC window frames (1.7 W/m²K) had marginally outperformed timber frames (1.8 W/m²K) and significantly surpassed aluminum frames equipped with thermal breaks (3.5 W/m²K).

2.3. Extrusion techniques and design complexity

Extrusion stands out as the efficient method of choice for manufacturing lengthy and continuous PVC profiles, particularly for window frames. This method, depicted in Fig. 5, involves the rotation of one or more screws within a heated cylinder or barrel, wherein the PVC compound is introduced. These screws propel the compound towards a die, meticulously shaping it into the desired configurations, as illustrated in Fig. 6. Following extrusion, the profiles undergo a cooling process, leading to some degree of shrinkage. To mitigate this, most profiles pass through a shaping device equipped with a vacuum box or water cooling calibration sleeves. Subsequently, pullers guide the profiles for coiling or cutting, tailored to the specified lengths (Rosato 1998, 528–535).

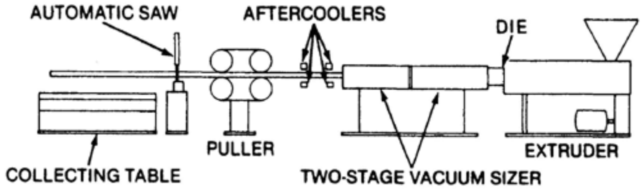

Figure 5. Extrusion line (Rosato 1998, 535).

Significant strides in screw design, cooling and sizing equipment, and overall process control in the latter half of the twentieth century led to a substantial increase in the speed of extrusion production lines. Between the late 1950s and 1980, the production capacity witnessed a remarkable three- to four-fold surge (Titow 1990, 498). However, this rapid pace also presented challenges, as the intensified cooling phase posed difficulties in maintaining precise dimensions. Consequently, it became evident that production speed not only affected the technical equipment but also the intricate geometry and complexity of the profiles (Lyall 1983).

The transformation in profile design complexity during this period was indeed significant. Early profiles extruded in the 1960s often overlooked the material's unique characteristics, merely emulating timber frames and lacking essential features such as groove slots for seals, hardware, or glazing beads (Bart, Hundertmark, and Keller 1995, 100). Furthermore, stringent requirements for mechanical properties and geometric specifications were imposed through rigorous quality control and certifications. These elevated standards were particularly crucial as PVC profiles became more standardized to ensure compatibility with various window frame systems (Rehau 1981).

2.4. Coloring and coating

Prior to the 1970s, the predominant method for imparting color to PVC window frames was mass-coloring, a process that involved adding pigments to the PVC resin prior to extrusion. Consequently, the vast majority of available window frames during this era were predominantly white (Pfeifer 1983, 136). This limited color diversity stemmed not only from production technology constraints but also from intrinsic material characteristics. Notably, (still) a matter of concern in the early 1980s were PVC's high thermal expansion coefficient and deformation, which posed challenges that were more pronounced in the case of dark mass-colored frames, further constraining the available color palette (Mainget 1983, 75; Bartholomé 1997, 84; Kripper and Musso 2007, 58).

In the 1970s, a novel approach, co-extrusion, emerged as a game-changer for PVC window frames. Co-extrusion involved the fusion of two thermoplastic materials, primarily PVC and acrylic, within a mold, which were then jointly extruded. This process resulted in an acrylic layer or coating on top of the PVC. The method brought several benefits, including reduced heat absorption by the PVC and the flexibility to experiment with colors at later production stages, thus allowing different colored coatings for the interior and exterior parts of the window frames. Additionally, this technique enabled the creation of textured coatings, such as those replicating the appearance of timber grain. However, the acrylic coating was prone to fragility (Trocal 1981, 19; Trocal 1979).

Moving to the 1980s and 1990s, two alternative coloring methods gained prominence: varnishing and foiling. In case of varnishing, the selection of an appropriate paint was crucial to avoid weakening the PVC (Kinet 1996, 56). Conversely, foiling involved the cold bonding of a printed or textured PVC film onto the PVC profile, but it exhibited issues with aging, particularly in the case of south-facing window frames (Federale Overheidsdienst Economie 2008, 22–23).

In all, during the latter part of the twentieth century, significant strides were made in coloring techniques, leading to the introduction of numerous colored and textured PVC window frame products to the market. Unfortunately, some of these products were later found to exhibit poor aging characteristics and dimensional instability. At that time, the absence of established standards on aging meant that manufacturers often provided minimal warranties, such as the five-year warranty offered by Trocal in 1979 for their co-extruded colored window frames (Trocal 1979). This practice was typical of an era marked by rapid technological advancements and fierce competition among companies (Buttenwieser, Chevet and Wetenschappelijk en technisch centrum voor het bouwbedrijf 1997, 44; 50–51).

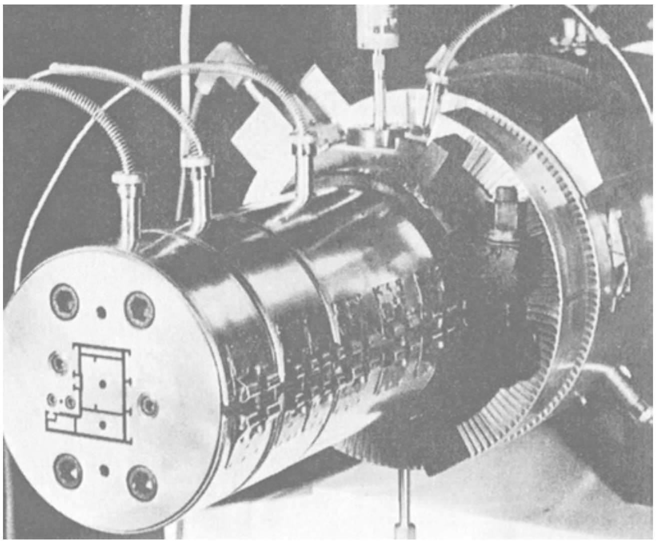
Figure 6. Die (Rosato 1998, 537).

3. Cost, color and comfort. Analysing advertisement strategies

As previously mentioned, the surge in demand for PVC window frames since the 1970s can be partially attributed to an extensive promotional campaign. In this section, we aim to investigate whether manufacturers of PVC window frames successfully harnessed technological advancements that emphasized the material's distinctive properties. Alternatively, we assess whether they highlighted other advantages primarily influenced by non-technological factors. To achieve this, we conducted a meticulous analysis of advertisements, with a specific focus on the arguments presented within them.

The comprehensive examination of the advertisements on PVC window frames revealed the presence of 16 distinct arguments, as depicted in Fig. 7. The primary arguments advanced by developers of PVC window frame system encompassed the variety of colors and finishes, improved thermal insulation, low maintenance and low cost. Notably, these same arguments were also put forward in advertisements for aluminum window frames.

Significantly, the arguments related to thermal insulation, maintenance and costs were consistently and continuously utilized throughout the entire period from 1975 to 2000. The cost-saving argument assumed particular prominence in the wake of the oil crises, as developers of PVC window frames eagerly emphasized the potential for reduced heating costs, attributing this to the "excellent thermal insulation provided by PVC window frames". Implicitly, this argument drew a sharp contrast with aluminum window frames, which were notorious for their poor thermal insulation, particularly when thermal breaks were lacking. The cost-saving aspect related to maintenance of PVC window frames not only offered a comparison with timber window frames, which typically necessitated maintenance every two to three years but also underscored the time-saving advantage, unequivocally favoring PVC window frames. Advertisers advocated that a periodic cleaning with water and a sponge sufficed to maintain their condition (Halsberghe Gebroeders pvba 1975; Deceuninck 1994). Notably, the cost savings in installation were attributed, in the advertisements, to the simplicity of on-site installation. However, the direct impact of cost-effective installation on the overall purchase price of PVC window was not explicitly mentioned. Indicative prices mentioned in 1995 in the periodical *Ik ga bouwen* for the installation of window frames in existing homes in Belgium disclosed that PVC window frames were priced at 6,500 to 8,500 Belgian francs per square meter, while meranti window frames were priced at 5,500 to 7,000 Belgian francs per square meter, and aluminum window frames with thermal breaks at 7500 to 8750 Belgian francs per square meter (Media Office 1995, 182). Consequently, advertisers refrained from the use of the term "cheap" but instead underscored the long-term cost-effectiveness of opting for PVC window frames.

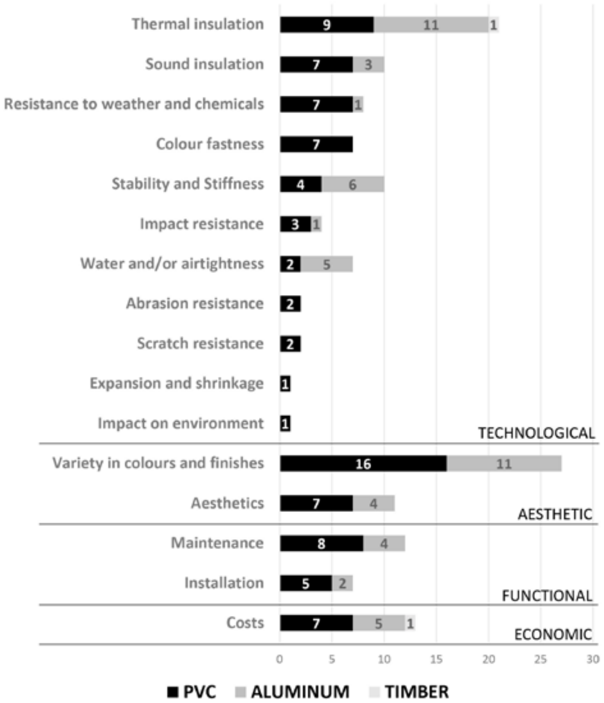

Figure 7. Arguments used by PVC window frame systems developers in advertisements in the journals A+ and *Nieuw/Neuf* and their frequency of use in advertisements for PVC, aluminium and timber window frame systems (Author 2023).

The prominence of a diverse range of colors and finishes in advertisements primarily materialized in the 1990s, spanning both PVC and aluminum window frames. This transition was instigated by substantial expansions in product offerings during this period. As an illustration, the company Trocal expanded its color palette from 7 options in the early 1980s to 28 by the year 1999 (Trocal 1999). Furthermore, the enhancement in color diversity was complemented by innovations in textures and finishes. In a 1994 advertisement, Deceuninck introduced a new coating process termed "Decoroc," involving the application of an oven-hardened coating, enabling the attainment of a textured, matte finish as an alternative to the conventional smooth finish (Deceuninck 1994, 1996). Despite the development of coloring and finishing techniques in the 1970s (e.g., the process of co-extrusion), it was not until the growing market demand for variety in the 1990s that these methods were further refined, leading to the expansion of product ranges.

The scrutiny of these advertisements spanning the years from 1975 to 2000 evidence the impact of socio-economic contexts on product development and architectural considerations. Whereas the 1950s and 1960s advertisements centered on operational characteristics of windows, such as opening systems, the 1970s and 1980s witnessed a surge in technological arguments, encompassing thermal and acoustic insulation, stability, stiffness, as well as water- and wind-tightness. This shift was primarily catalyzed by the 1973 oil crisis and was significantly influenced by rising standards associated with internationalization and the increasing specialization and professionalization of the industry. It was not until the 1990s, following economic recovery, that aesthetic considerations once again came to the forefront. PVC window frames were extolled for their "stylish" and "attractive" attributes, reflecting a burgeoning market demand for colored and nearly "customizable" window frame products. This transformation is also conspicuous in the advertising approach. In the 1970s and 1980s, technological arguments were frequently accompanied by detailed cross-sectional views showcasing the latest innovations, including features like multiple chambers, metal reinforcements, and improved sealing methods. (Fig. 8) However, in the 1990s, these intricate cross-sectional views gave way to vibrant drawings and project photos. (Fig. 9)

Conclusion

The period from 1975 to 2000 witnessed significant technological advancements in PVC window frames, encompassing enhancements in their geometry, thermal efficiency, coloration techniques, and manufacturing processes. These innovations, while pivotal for PVC window frames, were intrinsically connected to the broader landscape of the construction industry. The surging demand for PVC window frames during the 1970s can indeed not be disassociated from the prevailing socio-economic milieu, characterized by a concerted effort to curtail energy expenses in building structures. In tandem with the imperative for improved thermal efficiency, there existed mechanical and comfort prerequisites concerning rigidity and sleekness, which precipitated intricate transformations in profile design. Aesthetic considerations, such as the introduction of a diverse array of colors and textures, also left an indelible mark. These combined requisites propelled PVC window frames from their relatively simple origins to the status of high-tech products, embodying a characteristic term of the late twentieth century.

The relentless pursuit of higher standards and enhanced quality, exacerbated by the intensifying global competition due to internationalization, necessitated the optimization of production processes and machinery. Ultimately, the substantial demand for PVC window frames served as the impetus for these innovations at the component level, fostering a culture of experimentation and progression in the processing of PVC and other plastics into semi-finished and finished products. This exploratory research into the emergence and evolution of PVC window frames from 1975 to 2000 underscores the value of investigating seemingly ordinary construction components (Van de Voorde and Wouters 2021). It illustrates how even the most commonplace elements can offer invaluable insights into the dynamic evolution of the built environment.

Figure 8. Cross-sectional detailing in advertisement of Deceuninck Plastics from 1982 (photo document library UCLouavin, BAIU-Bruxelles).

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Figure 9. Advertisement of Rehau in A+ (Rehau 1991).

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