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PRINTING INDUSTRY PROVOCATEUR

Evolution sheetfed offset presses (summary by Google Gemini)

1: Speed

Question: "*How has the speed of sheetfed offset printing presses in the B1 format evolved between 1972 and 2024.*

Check press articles and press releases from Heidelberg and KBA from the years when there was a drupa trade show: 1972, 1977, 1982, 1986, 1990, 1995, 2000, 2004, 2008, 2012, 2016, 2024."

Answer:

The speed of sheetfed offset printing presses in the B1 format (approximately 70x100 cm or 72x102 cm or 74x105 cm) has significantly evolved between 1972 and 2024. Based on available press articles and releases from Heidelberg and Koenig & Bauer (KBA) during drupa trade show years, here's an overview of this evolution:

Heidelberg

- **1972:** No specific data on B1 format sheetfed offset press speeds was found for Heidelberg during drupa 1972. While some results mentioned other press models like the Speedmaster 72 (B2 format) with speeds of 11,000 sheets per hour (sph) in 1974, no direct information for B1 presses at drupa 1972 was available.
- **1977:** No specific data on B1 format sheetfed offset press speeds was found for Heidelberg at drupa 1977.
- **1982:** The **Heidelberg Speedmaster SM 102 S** (B1 format, 72x102cm), which began production in 1981, had a **maximum speed of 13,000 sph**.
- **1986:** No specific data on B1 format sheetfed offset press speeds was found for Heidelberg at drupa 1986.
- **1990:** No specific data on B1 format sheetfed offset press speeds was found for Heidelberg at drupa 1990.
- **1995:** The **Heidelberg Speedmaster SM CD 102** model from 1995 was capable of speeds up to **15,000 sph**.
- **2000:** The **Heidelberg Speedmaster CD 102** (B1 format) was noted with a maximum speed of **15,000 sph**.
- **2004:** Heidelberg introduced the **Speedmaster XL 105** (B1 format) at drupa 2004, capable of attaining speeds of **18,000 sph**.

- **2008:** The **Speedmaster XL 105** with a perfecting device could achieve **15,000 sph** in perfecting mode.
- **2012:** The **Speedmaster XL 105** demonstrated a top speed of **18,000 sph** in perfecting mode.
- **2016:** While Heidelberg showcased the B1 inkjet digital Primefire 106, specific speeds for B1 offset presses were not explicitly highlighted in the available information for drupa 2016.
- **2024:** Heidelberg announced a new world record with its **Speedmaster XL 106**, reaching **21,000 sph**.

Koenig & Bauer (KBA)

- **1972:** No specific data on B1 format sheetfed offset press speeds was found for KBA at drupa 1972.
- **1977:** No specific data on B1 format sheetfed offset press speeds was found for KBA at drupa 1977.
- **1982:** No specific data on B1 format sheetfed offset press speeds was found for KBA at drupa 1982.
- **1986:** No specific data on B1 format sheetfed offset press speeds was found for KBA at drupa 1986.
- **1990:** No specific data on B1 format sheetfed offset press speeds was found for KBA at drupa 1990. A B2 press from KBA, the Rapida SR0-2, was mentioned with 15,000 sph, but this is not a B1 format.
- **1995:** No specific data on B1 format sheetfed offset press speeds was found for KBA at drupa 1995.
- **2000:** No specific data on B1 format sheetfed offset press speeds was found for KBA at drupa 2000.
- **2004:** No specific data on B1 format sheetfed offset press speeds was found for KBA at drupa 2004.
- **2008:** General product information for the **KBA Rapida 106** (B1 format) indicates speeds of up to **18,000 sph** for straight printing and **15,000 sph** for perfecting mode, which likely reflects the capabilities around this time.
- **2012:** The **KBA Rapida 106** was reported to achieve speeds of up to **18,000 sph** in straight printing and **15,000 sph** in perfecting mode.
- **2016:** KBA's B1 format **Rapida 106** was operating at speeds of up to **20,000 sph** for straight printing and **18,000 sph** for perfecting.

- **2024:** While KBA's presence at drupa 2024 highlighted advancements in digitalization and automation, specific new speed records for their B1 offset presses were not explicitly mentioned in the available press releases.

Summary of Evolution

The available information indicates a general trend of increasing speeds for B1 format sheetfed offset presses from both manufacturers over the decades. Heidelberg's B1 presses evolved from around 13,000 sph in the early 1980s to 21,000 sph by 2024. KBA's Rapida 106 was noted at 18,000 sph (straight) around 2008-2012, increasing to 20,000 sph by 2016. Data for earlier years, especially the 1970s and 1980s, is less readily available in specific drupa press releases or articles focusing on precise B1 offset press speeds.

For more details on specific models and their specifications, you can refer to:

- Speedmaster SX 102 | HEIDELBERG
- Heidelberg Speedmaster SM 102 S en Pressdepo 586
- Heidelberg offset including GTO, MO, Speedmaster SM CD, XL, and
- Heidelberg CD 102-6+LYYL(X2) Drupa 2000 | pressXchange
- Heidelberg lays claim to world's fastest press - Print Business
- KBA Rapida 105 - Koenig & Bauer
- KBA Rapida 106 DriveTronic SPC - UPG
- Used 4 colour KBA sheetfed offset machinery - PressCity
- Tech guide: B1 Offset Presses - Sprinter

2: Makeready time

Question: *"How did the time needed to set up a press for a new print job (changeover time) on sheetfed offset printing presses in the B1 format evolve between 1972 and 2024.*

Check press articles and press releases from Heidelberg, Komori, and KBA from the years when there was a drupa trade show: 1972, 1977, 1982, 1986, 1990, 1995, 2000, 2004, 2008, 2012, 2016, 2024."

Answer: The evolution of changeover (makeready) time on B1 format sheetfed offset printing presses from 1972 to 2024 has been a transformative journey, driven by increasing automation and sophisticated control systems. While specific quantitative data for early years is scarce, the general trend shows a dramatic reduction from hours to mere minutes for complex job changes.

The Manual Era (1972 - early 1990s): Hours of Makeready

In the early period, press setup for a new job was a highly manual, time-consuming process requiring significant operator skill and physical adjustments.

- **1972-1982 (drupa 1972, 1977, 1982)**: Makeready involved manual plate changing, extensive ink key adjustments, dampening system setup, and manual fine-tuning for registration and color. Presses like Heidelberg's GTO (a smaller format introduced in 1972, though B1 Speedmasters existed) and early B1 offset presses from KBA and Komori were largely mechanical. While "setup was simplified as much as possible" for smaller presses like the GTO, a B1 format multi-color job could easily take **1-2 hours or more** for changeover. Heidelberg did introduce its Alcolor-II dampening system at drupa 1982, which improved consistency but didn't drastically cut makeready time.
- **1986-1990 (drupa 1986, 1990)**: The advent of electronics began to offer initial steps towards automation. Heidelberg introduced CPTronic in 1986, a control system that allowed main functions to be controlled from a separate console. This was a significant step in centralizing control and reducing manual adjustments, albeit not yet leading to dramatic time savings. The concept of "rapid changeover times for job and format changes" was emerging, but still far from today's standards.

The Automation & Pre-setting Era (1995 - early 2000s): Towards Reduced Makeready

The mid-1990s saw the serious introduction of automation features directly aimed at reducing makeready times, driven by the need for shorter print runs.

- **drupa 1995**: This drupa marked a major shift towards automated functions.
    - Heidelberg began offering semi-automatic plate changing (Autoplate) and presetting functions for sheet size and thickness, enabling faster changes.

    - While specific times are not universally cited, these innovations aimed to cut makeready from over an hour to potentially **30-45 minutes** for standard job changes.
    - KBA also started emphasizing "high levels of automation, intelligent control and user-friendly operations which would minimise makeready times."
- **drupa 2000**: Automation continued to advance.
    - Heidelberg emphasized the "efficiency of the entire print process" beyond just new presses, highlighting the importance of overall workflow. Integrated workflows began to send presetting data directly to the press, further streamlining setup.
    - Komori also focused on automation with features like Komori High-Speed impression cylinder cleaning system (KHS), enabling quicker transitions between jobs. Makeready times were likely being pushed towards the **20-30 minute** range for simple job changes.

The "Short Makeready" & Autonomous Era (2004 - 2016): Minutes, Not Hours

The concept of "short makeready" became a major competitive advantage, with manufacturers pushing for increasingly rapid changeovers.

- **drupa 2004**:
    - Heidelberg showcased "Peak Performance" presses like the Speedmaster XL series, designed for maximum productivity and top quality, which included further automation to reduce makeready.
    - Komori advanced its KHS (Komori High-Speed) system with KHS-AI (Advanced Interface), integrating ink presetting, register presetting, and automatic blanket washing, aiming for faster makeready.
- **drupa 2008**: This drupa saw significant breakthroughs in makeready speed.
    - KBA with its Rapida 106, particularly with the DriveTronic SPC (simultaneous plate changing) and optional Flying JobChange modules, famously demonstrated **fifteen print jobs of 500 sheets completed in less than one hour**, a phenomenal achievement that implies a **makeready time of just a few minutes per job**. This showcased near-zero actual plate-changing time as plates were changed during washing sequences.
    - Heidelberg introduced the Speedmaster XL 105, which aimed for maximum productivity and included advanced automation features that contributed to rapid changeovers, often targeting **under 10 minutes** for a full job change.

    - Komori continued to refine its automation systems like the KHS-AI, achieving impressive makeready times by pre-inking, register presetting, and automated wash-ups.

- **drupa 2012**: The focus on "autonomous printing" and "Push to Stop" began to emerge, aiming to minimize operator intervention during job changes.
    - Heidelberg introduced the Speedmaster SX and CX series, bringing advanced XL-class automation to a wider range of presses, including automatic wash-up devices and advanced measuring instruments to reduce setup.
    - Komori showcased further advancements in its KHS-AI system and fully automatic plate changers.
    - KBA continued to push its makeready champions, like the Rapida 106, maintaining its lead in rapid job changes.
- **drupa 2016**: The concept of "Humanless print production" was a key trend.
    - Heidelberg further integrated its Prinect workflow, optimizing the entire production process for efficiency and reduced makeready.
    - Komori highlighted its "Smart Factory" concept and advanced automation to minimize setup times.
    - KBA continued to refine its Rapida series with features that ensured "minimise makeready times, energy consumption, and paper waste."

The Autonomous & AI-Driven Era (2024): Near-Zero Makeready

By 2024, the goal has shifted from simply "short makeready" to "autonomous makeready" where the press largely manages itself between jobs.

- **drupa 2024**:
    - Heidelberg showcased its "Peak Performance" Speedmaster XL 106, focusing on even higher levels of automation and AI-driven processes to minimize human touchpoints during job changes. The aim is for the press to prepare itself for the next job with minimal operator intervention.
    - KBA (Koenig & Bauer) emphasized digitalization, autonomy, and sustainability. Their presses incorporate extensive robotics and AI for automated setup, material handling, and quality control, leading to extremely fast changeovers.
    - Komori continued its "Connected Automation" strategy, showcasing presses that use AI and cloud integration to optimize job sequencing and drastically reduce setup times, often achieving changeovers in **just a few minutes**, or **even "on the fly"** for certain parameters.

Summary of Changeover Time Evolution:

Era	Typical Changeover Time (B1 Format)	Key Technologies & Focus
1972-1990	1-2+ hours	Manual plate changes, manual ink/dampening adjustments. Focus on mechanical reliability and multi-color printing. Early electronics (CPTronic) began centralizing control.
1995-2000	20-45 minutes	Introduction of semi-automatic plate changing (Autoplate), automated washing, and pre-setting functions from digital workflows. Shift towards shorter runs.
2004-2016	5-15 minutes	Full automation of plate changing (simultaneous/simultaneous plate change), automated ink/register presetting (KHS-AI), inline measurement systems. "Push to Stop" philosophy emerged, aiming for autonomous job sequencing. Koenig & Bauer demonstrated sub-10 minute makereadies.
2024 (and beyond)	2-5 minutes (or less)	Highly integrated workflows, AI-driven automation, robotics for plate and blanket changes, self-learning systems, and "autonomous" production where the press manages job changes with minimal human intervention. Focus on near-zero makeready.

In essence, what took hours in the 1970s now takes mere minutes, largely due to the relentless pursuit of automation, digital integration, and intelligent systems that optimize every step of the setup process. This drastic reduction in changeover time has been a crucial factor in enabling offset printing to remain competitive in an era of increasingly short print runs and on-demand production.

3: Quality

Question: *"How has the quality of sheetfed offset printing presses, expressed as 'lines per inch' (LPI) evolved between 1972 and 2024.*

Check press articles and press releases from Heidelberg, KBA, AGFA, Kodak, Screen from the years when there was a drupa trade show: 1972, 1977, 1982, 1986, 1990, 1995, 2000, 2004, 2008, 2012, 2016, 2024."

Answer:

The quality of sheetfed offset printing presses, expressed as 'lines per inch' (LPI), has undergone a significant evolution between 1972 and 2024. This evolution is not solely a function of the printing press itself, but rather a synergistic advancement across the entire graphic arts workflow, particularly in prepress technologies such as screening, platemaking, and Computer-to-Plate (CTP) systems. The presses, in turn, have evolved to precisely reproduce the finer details made possible by these prepress innovations.

Here's a breakdown of the evolution, based on information from Heidelberg, Koenig & Bauer (KBA), AGFA, Kodak, and Screen, with insights from drupa trade shows:

The Analog Era (1972 - early 1990s): Conventional AM Screening Dominance

In this period, print quality was primarily achieved through Amplitude Modulated (AM) screening, where the size of halftone dots varied to create tonal differences, while the frequency of these dots (LPI) remained constant.

- **Technology:** Prepress was largely analog, relying on photographic film and traditional platemaking. Precision was limited by the mechanical and optical capabilities of cameras and exposure units.
- **Achievable LPI:** For high-quality commercial printing, the typical screen rulings used were:
    - **1972-1982 (drupa 1972, 1977, 1982):** Common screen rulings for good quality work were around **133 LPI to 150 LPI**. For very high-end or art reproductions, **175 LPI** was considered a premium standard. Heidelberg focused on improving print quality and process stability with innovations like the Alcolor dampening system and computer-assisted control systems. KBA also emphasized high-quality sheetfed offset, but specific LPI figures were not typically a marketing focus for the presses themselves. Prepress companies like AGFA, Kodak, and Screen were developing film and photographic processes, with advancements in scanning and electronic retouching beginning to emerge.
    - **1986-1990 (drupa 1986, 1990):** Continuous refinements in analog prepress and press mechanics allowed for more reliable reproduction of **150 LPI and 175 LPI**. Heidelberg introduced the Speedmaster CD 102 for packaging, emphasizing substrate versatility and quality. Crucially, drupa 1990 marked the "digital revolution" with the emergence of desktop publishing (DTP), laser printers, and

imagesetters. The improved image quality from PostScript imagesetters, combined with "new screening technology," began to address issues like moiré, laying the groundwork for future LPI advancements.

The Digital Transition & CTP Revolution (1995 - early 2000s): Precision in Dot Reproduction

The mid-1990s witnessed a transformative shift with the advent of Computer-to-Plate (CTP) technology, which directly imaged digital data onto printing plates, bypassing the need for film. This significantly improved dot sharpness, consistency, and reduced potential quality issues from dust or film imperfections.

- **drupa 1995:** This show was a watershed moment for CTP.
    - **Screen** launched its first CTP system.
    - **AGFA** garnered attention for its digital prepress solutions, crucial for enabling finer screens.
    - **Heidelberg** introduced the Quickmaster DI, showcasing digital imaging directly on press.
    - **Impact on LPI:** CTP provided the precision required to reliably reproduce finer conventional screens, making **175 LPI to 200 LPI** more commonplace for high-quality commercial work. It also set the stage for more advanced screening techniques.
- **drupa 2000:** CTP matured and gained wider adoption.
    - **AGFA** showcased its Apogee PDF-based workflow and Galileo CTP systems, designed to handle precise digital screening.
    - **Kodak** focused on improving digital proofing systems for accurate halftone proofing, capable of simulating 70-100 LPI and with future enhancements, 150 or 175 LPI screens. This indicates the standards they were aiming to reproduce accurately.
    - **Heidelberg** and **KBA** continued to integrate automation and workflow solutions to optimize data transfer and digital workflow to the printing plate, directly supporting consistent high quality.

The Era of Stochastic & Hybrid Screening (2004 - 2012): Beyond Fixed LPI

With increasingly precise CTP systems, new screening technologies emerged to push quality boundaries further, often moving beyond the traditional LPI concept.

- **drupa 2004:**
    - **General:** Stochastic (Frequency Modulated - FM) screening began to gain traction. FM screens use dots of uniform size but vary their density and placement,

eliminating traditional screen angles and moiré. They don't have a direct LPI but offer a perceived resolution equivalent to much higher conventional LPIs (e.g., >300 LPI). CTP devices were capable of a 16-micron spot size, supporting up to **300 LPI** resolution and FM screening.

    - **Kodak** introduced new thermal CTP plates, enabling higher resolution imaging.
    - **Heidelberg** emphasized process stability and control through Prinect workflow and Axis Control.

- **drupa 2008:**
    - **AGFA** demonstrated its Sublima hybrid screening technology, which combines the benefits of both AM and FM screening, capable of achieving a perceived quality up to **340 LPI**.
    - **Heidelberg** launched advanced inline color measurement and control systems (Prinect Inpress Control, Prinect Image Control) to ensure consistent dot reproduction, critical for very fine screens.
    - **KBA** continued to advance automation, which supports high and consistent quality.
- **drupa 2012:**
    - **General:** While the 52DI press featured support for **300 LPI** and FM screening.
    - **Heidelberg** showcased Prinect Inspection Control for 100% sheet inspection, ensuring consistent quality.
    - **KBA** continued its focus on automation and integration to maintain high quality at speed.

Peak Performance & Automation (2016 - 2024): Consistently Reproducing Ultra-Fine Details

By this period, the technological capability to produce and reliably reproduce extremely fine screens became a standard for high-end offset. The focus shifted to maximizing consistency, efficiency, and sustainability while maintaining the highest quality.

- **drupa 2016:**
    - **Screen** unveiled CTP devices like the PlateRite HD 8900 thermal CTP device, capable of resolutions up to **2,400 dpi**. This level of resolution can support conventional AM screens up to **400-600 LPI** (though such high AM rulings are rarely used in commercial printing due to printability challenges) and extremely fine FM screening. ThermoFlexX also showcased digital flexo plate imagers with resolutions up to 5,080 dpi, enabling 250 LPI halftone screens.

- **Heidelberg** and **KBA** highlighted advanced automation, inline inspection, and smart workflows to ensure that the precision achieved in prepress is consistently transferred to the printed sheet.

- **drupa 2024:**
  - **General:** The focus was on "autonomy," "AI," and "sustainability," which indirectly contribute to consistent, high quality. The ability to print with high consistency supports the reproduction of the finest possible screens.
  - **Heidelberg's** new "Peak Performance" generation of Speedmaster XL 106 presses emphasizes enhanced quality, efficiency, and sustainability.
  - **Kodak** showcased advancements in process-free plates (SONORA Ultra and SONORA XTRA) and their MAGNUS Q800 Platesetter (fastest 8-page CTP), which offer improved image contrast and plate stability, allowing for the consistent reproduction of extremely fine dots that define high LPI or FM screening.
  - Modern offset presses are engineered to reproduce a wide tonal range, often from 1% to 99% dots, supporting highly detailed reproduction with conventional screens up to **240 LPI or 300 LPI** for demanding applications, as well as the most advanced FM screening techniques.

Summary of LPI Evolution:

The evolution of print quality, measured by LPI, in sheetfed offset printing is a testament to the synergistic advancements in prepress technology and press engineering. From a common **133-175 LPI** in the analog era, the industry moved to reliably reproduce **175-200 LPI** with the advent of CTP in the mid-1990s. The early 2000s saw the widespread adoption of stochastic and hybrid screening, offering a perceived quality equivalent to **300 LPI and beyond**, supported by high-resolution CTP (2400 dpi and higher). By 2024, the capability to consistently achieve the highest print quality using very fine AM screens (e.g., **240 LPI, 300 LPI**) or advanced FM screening is a standard feature of modern sheetfed offset workflows.