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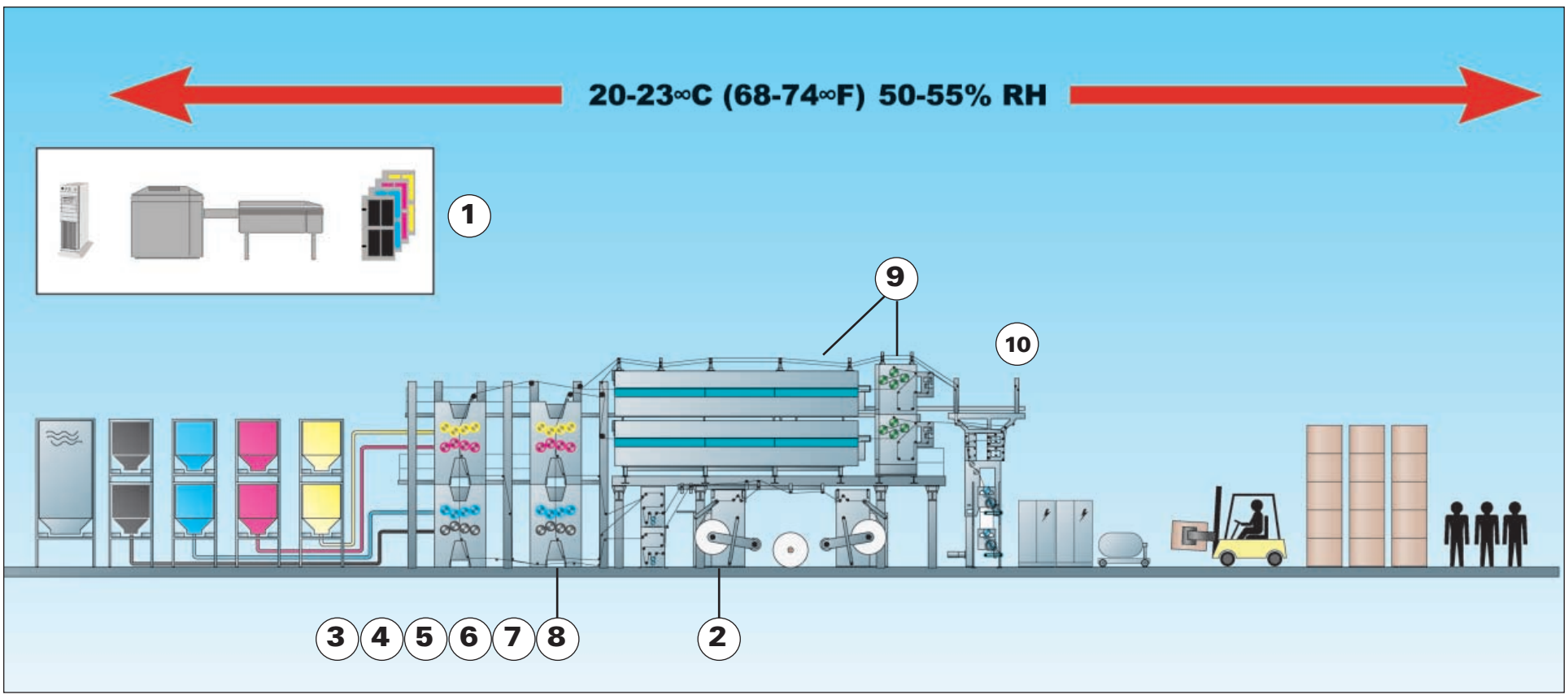
Best practices for web offset printers



Systems & components

These priority areas for productivity maintenance were determined from a survey of 30 heatset and coldset printers and Web Offset Champion Group members' maintenance staff.

10 key component and consumable areas

1. Platemaking conditions and control
2. Paster (brushes/foam rollers, knives, photo cells)
3. Dampening system and solution
4. Roller wash-up, setting and care
5. Ink duct, metering, maintenance and cleaning
6. Blanket and packing inspection, adjustment and change
7. Plate and blanket cylinder cleaning
8. Control ink fly and drops
9. Dryer and chills cleaning and inspection
10. Folder: Slitter knives, trolley, anvil, settings and jams

Reliable production requires good maintenance and a clean environment.

10 critical system-wide factors

- Ambient temperature, humidity and water supply
- Compatibility of consumables and chemicals
- Clean, check and calibrate equipment
- Lubricate, check and change all filters
- Web tension
- Air system (clean and dry air)
- Electrical and drive systems
- Level, parallel and clean idle (pipe) rollers
- Eliminate leaks (air, ink, oil and water)
- Operator procedures and ongoing staff training

3C's: Clean, check and calibrate

Untidy working environments, dirty equipment, liquid leaks and loose parts reduce component life from accelerated wear, high temperatures and contamination. These all undermine press productivity. The first condition of effective maintenance is to implement effective cleaning and checking routines. To be effective they require available time along with clear procedures and training.

Cleaning: Eliminate dirt, dust and contamination that increases abrasion, clogs feed lines and reduces cooling of motors and electrical cabinets. Only use compressed air for cleaning where specifically recommended as its high pressure can damage sensitive components and the disturbed debris is not removed. Use an industrial vacuum cleaner. Use the right materials and solvents. Clean any liquid off the floor and steps to avoid high risk of injury from slipping and falling. Cleaning made simultaneously with lubrication avoids excessive lubrication being left on components.

Sensors: Clean all pressline sensors daily to avoid malfunctions and press stops. Clean lens and reflectors with a dry anti-static cloth. For deeper cleaning use a soft cloth soaked in alcohol but do not use organic or hydrocarbon solvents that will destroy the cells.

Solvents: Health, safety and environmental legislation (see DIN standards 16 621 and 52 521) have led to cleaning solvents with a higher flashpoint and lower volatile organic component. These washes are less aggressive, more "oily," often mix with water and require correct dosage.

Therefore, some changes are needed to cleaning methods. Do not soak cleaning cloths with a large quantity of low-evaporation VOC wash or too much solvent will be applied to the roller or blanket. The surplus will remain as an oily film and cause problems when restarting the press. Drips of solvent-water emulsions on to metal surfaces may cause corrosion.

Check tightness: A loose component can cause abnormal vibrations and may eventually break or come loose. In the worst case these can fall into another part of a machine with massive damage potential.

Correct calibrations and settings: This will avoid many chronic small press stops, improve print quality, makeready efficiency and reduce waste. Key areas: web tension, printing pressures (including the right plate-blanket squeeze), ink fountain and ink key slides, roller settings and durometer, dampening chemistry. Record benchmark settings and check them regularly. Each unit should have best operating conditions recorded and readily available to consult.

Lubrication and mechanical drives

Component wear is caused by abrasion, corrosion and direct metal-to-metal contact. Correct lubrication will reduce wear and prevent failures. Over and under lubrication is a major threat to component life and seals.

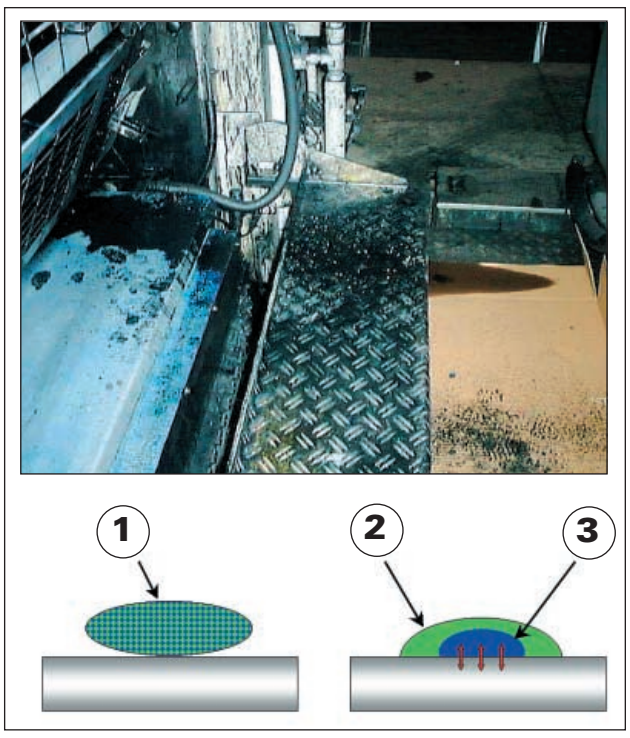
- Use a systematic lubrication schedule (with a clear responsibility) using only the recommended lubricant (substitutes may not meet all specifications).
- Ensure grease guns and oil cans are the right type, work properly and the lubricant is clean. Consider color-coding lubrication points and their matching grease guns and oil cans.

Oil filters and changes: Use the supplier's schedule. Change the oil and filter together.

Automatic lubrication systems: These have a tendency to be overlooked and require periodic attention.

Oil analysis: Regular oil analysis indicates the condition of closed-loop lubrication systems. Samples should be taken immediately after a press stop and are usually analyzed by a specialist laboratory service.

Best practice | Poor practice | Machine stop | Poor runnability | Avoidable cost | Safety risk | Quality issue



Source: Böttcher

Solvent encapsulated water droplets (right) cannot evaporate and will attack the metal surface causing corrosion.

1) Emulsion 2) Solvent 3) Water

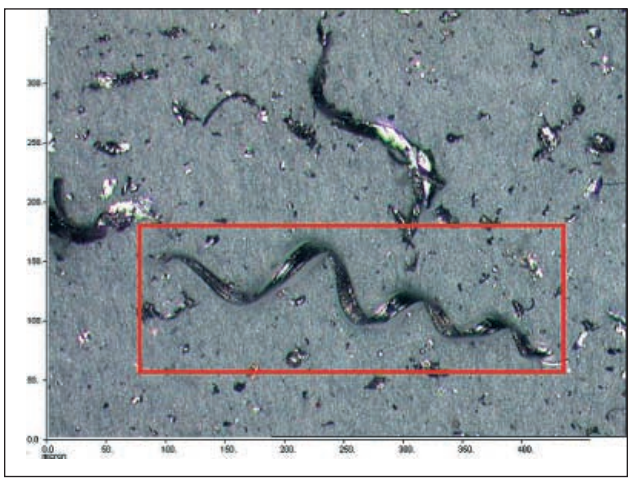


Photo: University of Wales

Swarf wear debris particles in the oil indicate the beginning of a component failure.

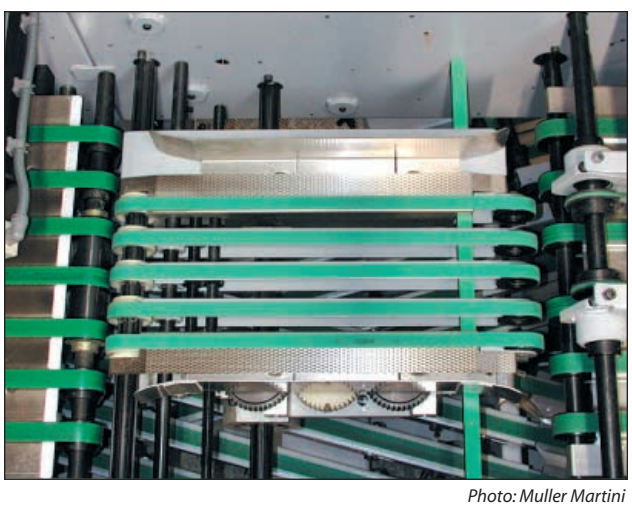


Photo: Muller Martini

Inspect belts regularly for wear, cracking and correct tension. Under-tension reduces power transmission and over-tension can damage drive motors.

	Daily	Weekly	months 1	3	6	12	Slow	Stop	Safety	Quality
General check and clean										
Galleries, stairs and footplates	✔								⚠	
Remove paper debris, vacuum clean	✔						●	✋	⚠	
Physical check, visual, noise, odor	✔									
Drops of oil, water, ink falling on to web	✔							✋		🔍
Clean signs & indicator lights	✔								⚠	
Clean sensors	✔							✋		
Use the right solvents							●	✋	⚠	🔍
Lubrication and Mechanical drives										
Systematic greasing/oiling schedule								✋		
Check oil levels and change filters	✔							✋		
Chains				✔			●			
Pulleys				✔			●			
Belts			✔				●			
Gears and bearings						✔				🔍
Idler (pipe) roller cleaning		✔								🔍
Motors & Electrical systems										
Ensure air cooling passages are clean		✔					●	✋		
Clean filters of motors & electrical cabinets		✔					●	✋		
Turn collector and change brushes						✔				
Monitor motors	✔							✋		
Follow motors maintenance as specified								✋		
Replace batteries in PLC						✔		✋		

Frequency *Related problems : ● Slow running, ✋ Machine stop, ⚠ Safety, 🔍 Poor quality.*
This is a generic example only. Refer to suppliers recommended procedures and time intervals.

Chains: These have a high number of mechanical parts and links that require frequent lubrication and cleaning to prevent failure.

Pulleys: Periodically clean, lubricate and check alignment. Check walls to ensure they are smooth and square in profile.

Belts: Inspect regularly for wear, cracking and tension. Under tension reduces power transmission and over tension can damage drive motors. Loosen tension when changing to avoid stretching or damage. Check alignment and use belt tension testers to reduce pulley wear and extend belt life. Never use lubricants on belts and always use specified belt type.

Gears: Maintenance depends on the type and use. Follow manufacturers' recommendations.

Bearings: Each bearing type has a specific lubrication profile and only recommended lubricants should be used at scheduled intervals.

Idle (pipe) rollers: Periodically check they are parallel, nip settings are correct and bearings run free.

Motors and electrical components

The keys to long motor (and pump) life is good cleaning and maintenance. Up to 80 percent of malfunctions are caused by dirt and dust contamination that act as an insulator and blocks air intakes, causing excessively high temperatures.

- Clean air intakes frequently, preferably with a vacuum cleaner. Clean or replace filter screens regularly.
- Check motors daily for unusual noise or heat. Measure benchmark levels of ultrasound, vibration, bearing temperature and power consumption. Any deviations indicate deterioration.
- Turn collector and change brushes every 5,000 to 15,000 hours according to their condition.
- Qualified staff should rigorously follow recommended maintenance schedules.

Electrical cabinets: Correct cleaning (with power off!) prevents overheating and extends component life. Remove filters for cleaning and replace as needed. Vacuum out dust (never use compressed air) and clean relays with a contact cleaner that does not deteriorate plastic. Check that connections are tight, as press vibrations can loosen them.

PLC backup batteries: A low battery can lead to loss of program. Replace every one or two years following suppliers' instructions.

Compressed air

Compressed air often contains scale, rust and other contaminants that under pressure enlarges existing leaks and creates new ones. To

Chilled water systems

Regular optical and acoustic checks for leaks, pressure levels, abnormal noises or vibrations will reduce the risk of damage and lost production.

Rotary unions: Inspect regularly for leaks. Follow hose pipe fitting procedures at replacement and ensure that a flexible hose is always used to connect the coupling and rigid supply pipe.

Check temperatures: Deviations from the desired value may cause condensation on the chill rolls, ink viscosity and misting, or poor heat evacuation from press components. Insufficient web cooling after the dryer may cause marking. Incorrect temperatures can damage rotary unions.

Vent system and refill: Cooling systems work in a closed loop and have to be vented regularly to ensure sufficient water circulation and heat transfer. Water inside the system may stop the refrigeration unit and raise temperatures; in the worst case, the complete cooling system will fail.

Clean cooling tower/condenser: Remove dust particles and mud to ensure maximum cooling capacity.

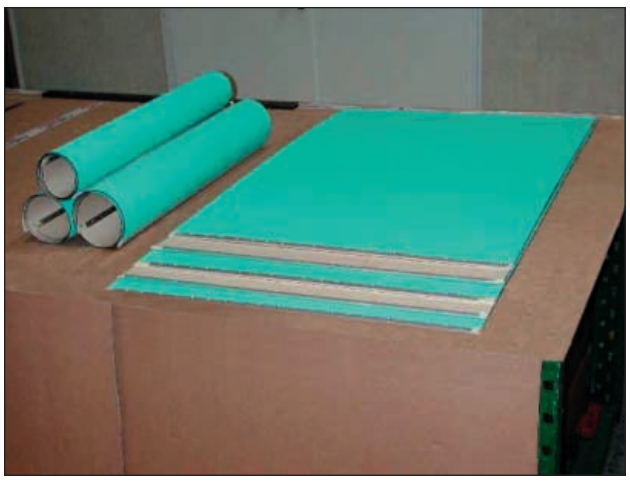
Water filters: Clean regularly to prevent restriction of water circulation. Missing or damaged filters can harm rotary unions.

Liquid systems	Daily	Weekly	months 1	3	6	12	Slow	Stop	Safety	Quality
Compressed air: Check oil level	✔							✋		
Drain water condensation valves	✔							✋		
Clean or replace filters		✔						✋		
Check safety and relief valves		✔							⚠	
Check contamination indicator		✔						✋		
Check pressure settings		✔						✋		
Check compressor and hoses for leaks			✔				●			
Change oil and inspect for contamination			✔				●			
Check for rust and corrosion			✔				●			
Record noise level			✔				●			
Water: Check incoming quality		✔								🔍
Cooling systems: Clean water filters		✔						✋		🔍
Check for leaks & system pressure	✔						●		⚠	
Check rotary unions			✔							🔍
Compare temperature with set-points		✔					●			🔍
Vent system & refill					✔			✋		🔍
Clean cooling tower/condenser				✔			●		⚠	🔍
Complete system service						✔	●	✋	⚠	🔍

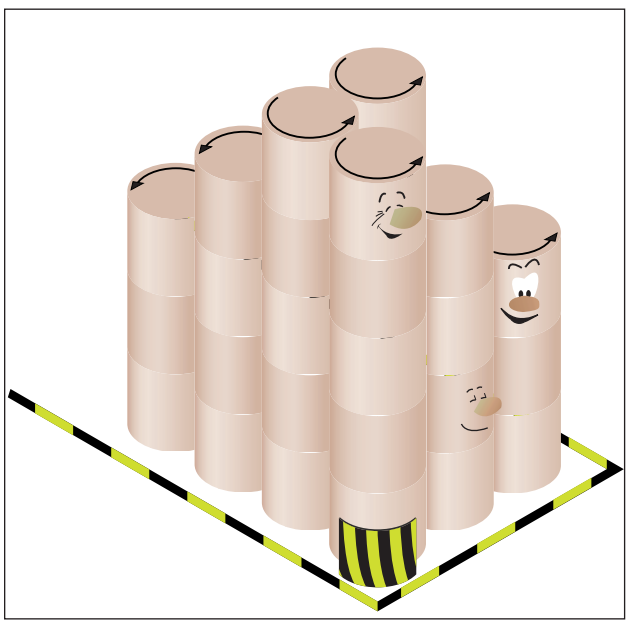
Frequency *Related problems : ● Slow running, ✋ Machine stop, ⚠ Safety, 🔍 Poor quality.*
This is a generic example only. Refer to suppliers recommended procedures and time intervals.

Photo: Megtec

Dust around the press is sucked into the electrical cabinet and trapped by the filter. If the filter is not cleaned, electrical components will overheat and damage them and may cause a fire.



Blankets should be stored flat to prevent an against-the-print-direction set that makes them harder to mount. It is important that nothing rests on blankets as they will become deformed.



Rolls should be stacked in bays on their ends in straight lines with the same unwind direction. Protect outer rolls with guards.

compensate, air pressure is frequently increased, which only makes the problem worse. Commonly, up to 10 percent to 25 percent of air is lost, representing an expensive energy cost. Leaks are invisible and odorless and their hissing sound is often lost in background noise. Use an ultrasound unit to locate and fix air leaks. Check oil levels daily, open and drain water condensation valves and listen for abnormal noises or vibrations.

Weekly, check air pressure and contamination indicator; if fitted, clean or replace air filters (filters are available to remove both moisture and oil vapor from the incoming air), check safety and relief valves. Monthly, inspect compressor and hoses for leaks, change oil and inspect for contamination, check rust and corrosion and record noise level.

Water

Water quality has a significant impact on many parts of the printing process and on maintenance requirements. These range from dampening solution efficiency to deterioration of plates, blankets and rollers, bacteria growth, corrosion, buildup of scale (corrosive salts) in pipes, chilled rolls and cylinders that reduce energy transfer. Water is a complex fluid with a highly variable composition that changes between localities and over time. Best practice is to regularly analyze the suitability of water for printing at each site. Where water treatment is required (softening, demineralization, reverse osmosis) then define what additives are needed to provide a balanced water for printing (range of pH 4,8-5,3 in Europe / pH 3.5 - 4,0 in the United States) and constant conductivity.

The dampening solution water will require other additives to stabilize its pH value to ensure good printing and other critical characteristics. Buffer system additives inhibit equipment corrosion and control bacteria growth and alkaline impurities. While conductivity has no impact on printing, high concentrations may cause press corrosion above 1500 miliSiemens per centimeter. The extremely pure water from reverse osmosis is very aggressive against metal and requires additives to harden-neutralize it before leaving its plastic storage tank.

Bacteria growth can restrict the flow of dampening water (particularly through spray nozzles), reduce fountain solution pH and significantly impair the printing process. Fountain solutions contain a biocide to kill most algae. To be effective, the strength of the solution must be maintained within the manufacturer's tolerances. Check concentration regularly. If the problem is severe, it may be necessary to drain down the system and flush it through with a special solution. (For more information see "Fountain solution fundamentals of offset dampening" published by Sun Chemical Hartmann).

Materials storage conditions	Keep in packaging	Storage position	Sensitive to UV	Sensitive to Ozone	Max. storage time/months
Paper	✔	On end	✔		6
Pasting tabs & tapes	✔	On side	✔		6
Inks	✔		✔		3
Blankets	Unroll	Flat	✔	✔	6
Rollers	✔	Vertical	✔	✔	3
Plates	✔	Flat	✔	✔	12
Chemicals	✔	Vertical	✔	✔	3-6
Optimum storage and operating environment		***Temperature 20-25° C (68-77° F) Relative humidity 50-55% RH***			

Materials selection and care

Check before change: Changing any consumable materials in a stable process may upset the chemical balance on the press. Only change one consumable element at a time. Prior to any change, test the chemical compatibility of blankets, roller rubber, ink, fountain solution and solvent chemistry.

Inspect incoming materials: Ensure packaging integrity and that delivery conforms to specification ordered. Use a digital camera to record any damage.

Control inventory: All materials should be used on first-in first-out basis to avoid deterioration over time, reduce risk of damage and make better use of use of working capital.

Poor storage conditions: Increased risk of damage and deterioration to materials and unscheduled press stop. All consumables should be stored (and used) in an ambient environment range of 20 to 25 C (68 to 77 F) and 50 percent to 55 percent RH to maintain dimensional stability, minimize static and avoid premature ageing. Most consumables will deteriorate if stored near electric motors, appliances or switch cabinets that create ozone. Storage areas should be dust- and draft-free and conform to all safety, fire and other regulations.

Correct storage

Paper: Keep rolls wrapped until they are prepared for splicing. Store on a dry, clean and level floor with a temperature similar to the pressroom. Rolls should be stacked in bays on their ends in straight lines with the same unwind direction. Protect outer rolls with guards and allow sufficient working space for handling.

Pasting tabs and tapes: Keep in packaging until used. Their adhesive properties are strongly influenced by excessive temperature and humidity variations.

Ink: Inks are poor heat conductors and adjust to temperature changes slowly. Below 18 C (64 F) ink viscosity rises causing pumping difficulties, over 30 C (86 F) the viscosity drops leading to running problems.

Plates: Store in their packaging until they are required to minimize static and dimensional instability.

Blankets: Unpack rolled-up blankets and check to see if thickness is correct and bars are parallel. Ideally they should be stored flat to prevent an against-the-print-direction set that makes them harder to mount. It is important that nothing rests on them as they may become deformed. Stack blankets alternately face-to-face and fabric-to-fabric to a maximum of 14 blankets in a pile to avoid damaging the lower ones. If it is not possible to store the blankets flat they can be kept rolled vertically in their delivery tubes. Rolled-up blankets should never be stored horizontally, as this will deform them. Blanket stocks should be rotated to avoid any blanket being stored for more than six months. Sleeves should be stored vertically in their delivery boxes.

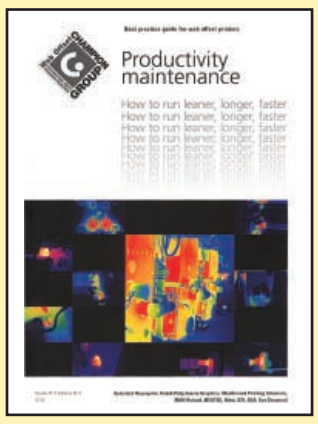
Rollers: These should remain in their special protective wrapper until they are installed in the printing unit. Keep them in cool and dry conditions and away from UV light and ozone to avoid the premature ageing of their rubber. Store in vertical racks (supported by their journals or cores) to avoid permanent deformations (low spots). If stored for long periods change from top to bottom every month.▲

Many productivity problems are related to the incorrect selection, combination and storage of consumables. Purchase specifications should be based on quality, compatibility and performance during the printing process. Low-performance consumables can increase total production cost out of all proportion to any purchase cost savings.

- Ideally an internal team (production, purchase and maintenance staff) should work with qualified suppliers to define written specifications that conform to printing needs for all consumable materials. A data sheet for each should be available to press crews.

- Each machine should have a list of consumable parts (filters, belts, etc.), which should always be in stock.

This article is an extract from "Productivity Maintenance ... How to run leaner, longer, faster."



The Web Offset Champion Group was formed in 1998 to "champion" best practice in the web offset printing industry as a tool to improve productivity, quality and safety. Other guides available are:

- "Roll to web processing"
- "Web break prevention & diagnostics"
- "How to avoid surprises when changing paper grades"

Copies are available from GATF (www.gain.net)

Members of the Web Offset Champion Group include:

Aylesford Newsprint
Kodak Polychrome Graphics
MacDermid Printing Solutions
MAN Roland
Megtec Systems
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