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Web Cleaning: Truth or Consequence?

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In today's high stress business environment, the balance between profit and loss for web printing operations is closer than ever before. More competition for jobs, the cost of labor, and productivity demands have pushed manufacturers to find ways to differentiate themselves and their companies from the competition. Quality is, and always has been, the magic word.

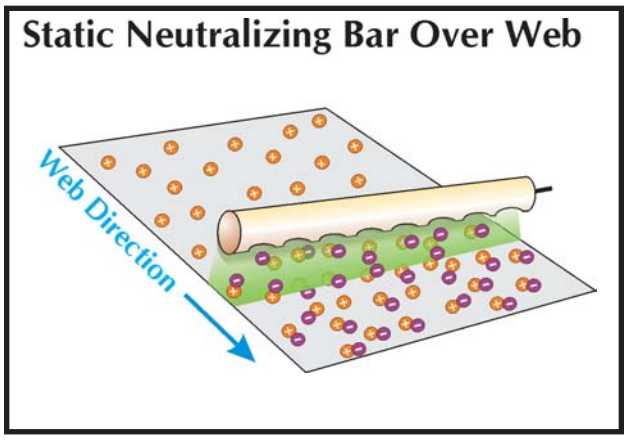
Quality generally translates into more colors, higher resolution, ability to deal with different materials, the list goes on and on. Unfortunately, quality usually means more production steps that slow down the line and contamination problems that cause constant stoppages to clean equipment.

The question is always, "How can I clean my web consistently, and cheaply?". The fact is "it ain't easy!"

To successfully clean a moving web, you must understand the influences that are causing the contamination in the first place. It's easy to identify where a lot of the contamination comes from, the manufacturing process that produces and slit's the base material (paper, film, etc.). But, what holds it there and why does it appear to attract more dirt as you run your process? The fact is, it's static electricity, and a boundary layer of air.

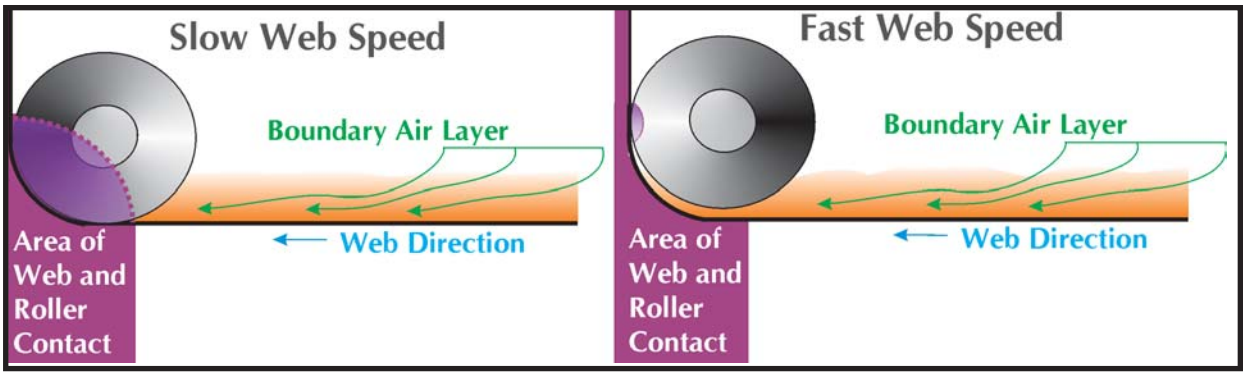
Static charges are generated from the contact and separation of the material as it's being pulled from the feed roll and as the material passes over the rollers of the press. The result is an electrostatic adhesion that holds dirt to the surface. Also, web speeds will complicate this process since the faster the web travels the higher the static charge level.

Static electricity cannot be totally eliminated, but it can be neutralized/controlled with the use of ionized air created actively (electrical source) or passively (tinsel). Active static eliminators are the most effective method, because they will reduce the charge levels closer to the theoretical zero level while passive elimination will only be effective to a threshold charge level.



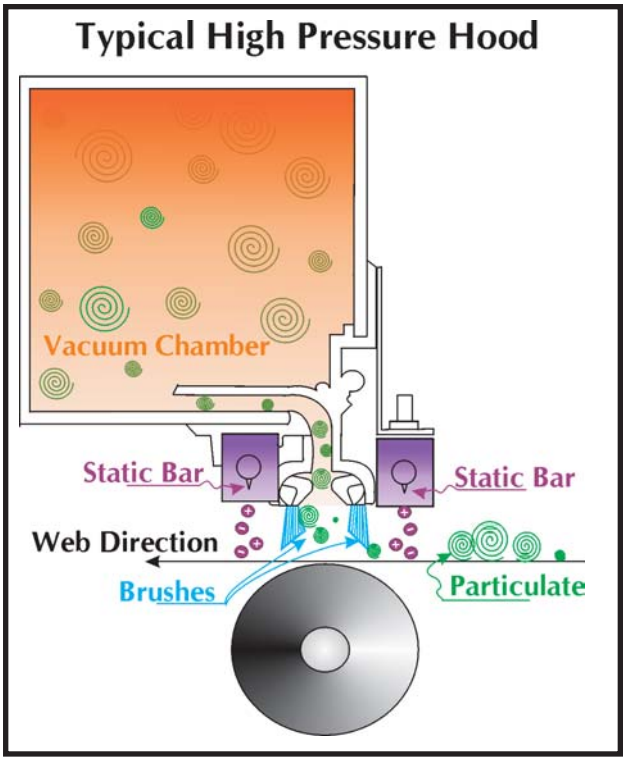
Static Neutralizers produce an electric field, causing a breakdown of the air molecules into positive and negative ions near the ionizing points. Any charged material passing through the field will attract ions until the charge is neutralized - so that static charges are reduced to safe levels even on fast moving webs

The moving web creates the boundary layer of air. The faster the material is moving determines the depth of the layer and the difficulty of removal. High velocity air has been tried to break through this layer and simply blow particulate off the surface. This approach doesn't help because the contaminants disperse into the air and recontaminate the material downstream. The bottom line is

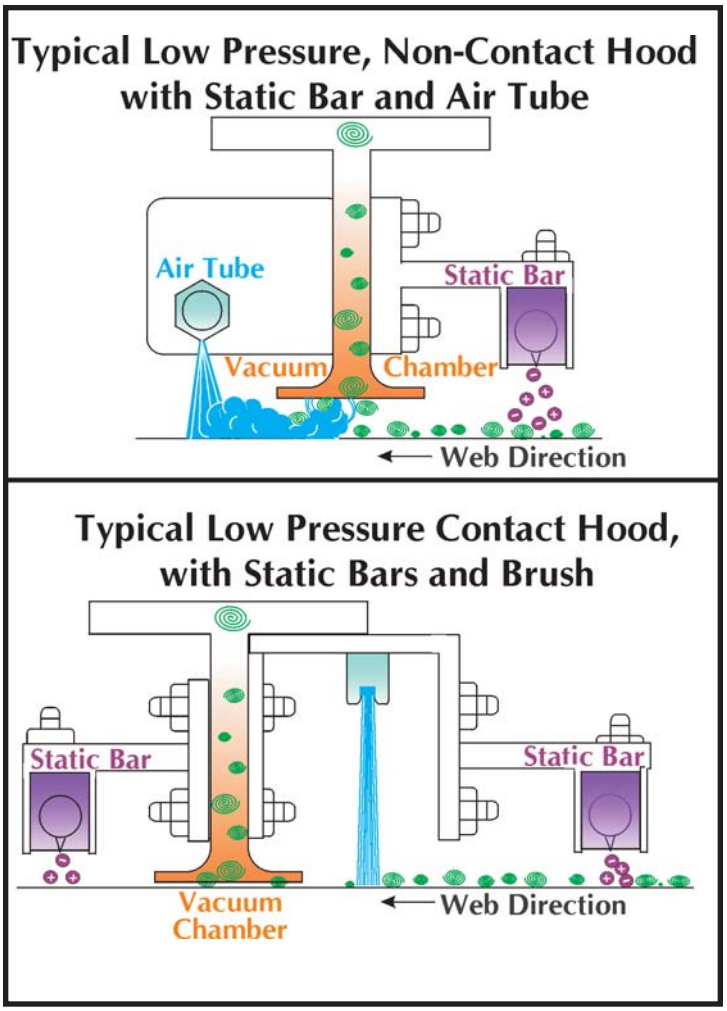


that the boundary layer of air traps the smaller particles (50 microns and below), and makes the cleaning process extremely difficult.

Traditionally web printers have used high efficiency vacuum systems fixed with static control equipment, and placed strategically (and painfully) on their presses to control contaminants. This method has been used very successfully for many years, and remains perhaps the most cost-effective method, when your cleaning requirements can tolerate cleaning levels to approximately 25 microns. There are several systems, and suppliers, available which incorporate "high pressure" or "low pressure" vacuum technologies (or combinations depending on your susceptibility to marketing presentations). There is much discussion as to which technology is more effective, but the truth is both have proven to be effective when they are properly mounted. High-pressure systems require a fixed mount over a secured surface (generally a roller). The vacuum hood can be set close to the material and the air loss can be minimized with the use of brushes or chadd blades designed to keep the high velocity air close to the surface of the web. Theoretically, they use tremendous suction to overcome the boundary layer of air and remove the contaminants from the surface.

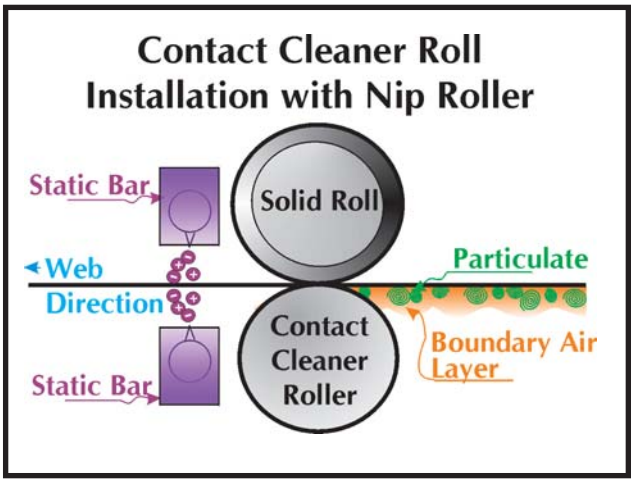


Low-pressure systems have fewer mounting restrictions, and are designed to remove particles from the air that have been lifted from the surface of the material. Usually the systems are configured as contact (brushes) or non-contact (compressed air bars), with the intention of penetrating the boundary layer and colliding with surface contaminants to lift them for removal. In theory, these units move and clean volumes of air.



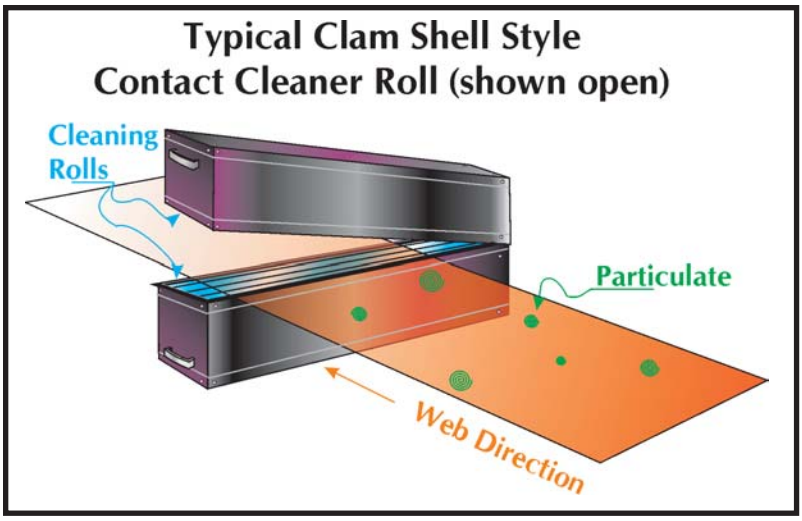
several suggested methods of applying the contact cleaners. The most successful method is a "nipped" arrangement where the CCR is tightly mounted to an idler roller, or another CCR, in order to achieve sufficient web tension. The tension squeezes out the boundary layer of air for high efficiency particle removal. The nip configuration is less impacted by changes in web speed than other mounting configurations. This nipped CCR has a higher contact pressure between the web and the CCR, maintaining nearly 100% contact at all times. Tests of contact cleaners using a nip configuration have shown efficiency levels of up to 96% in removing particles smaller than 10 microns. There are two other common CCR mounting arrangements, as an idler roller and as a turret configuration. Both have proven to be less effective than a nip configuration.

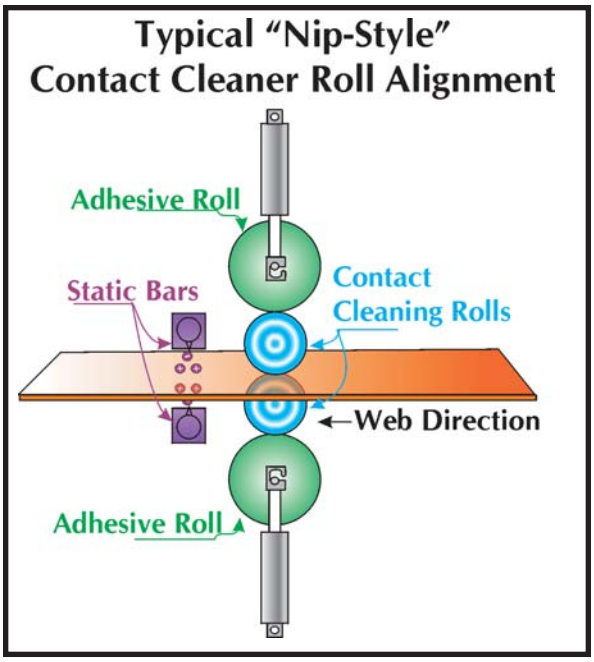
Unfortunately the quality demands on web printers today have increased to the levels where 25 micron cleaning may not always be enough. The traditional vacuum systems do not meet the almost cleanroom level requirements of 1 micron. An excellent solution appears to be the contact (tacky roll) cleaners used in the electronics industry to remove very small particles. Particles on the web come in contact with, and adhere to a low durometer contact cleaner roll (CCR). A separate adhesive tape roll contacts the CCR, removing the particles and keeps the CCR continually clean.



As with the vacuum systems, there have been

Industry use has demonstrated that although CCR systems work very well at small particle removal it becomes a maintenance issue to keep manually stripping off layers of the tape

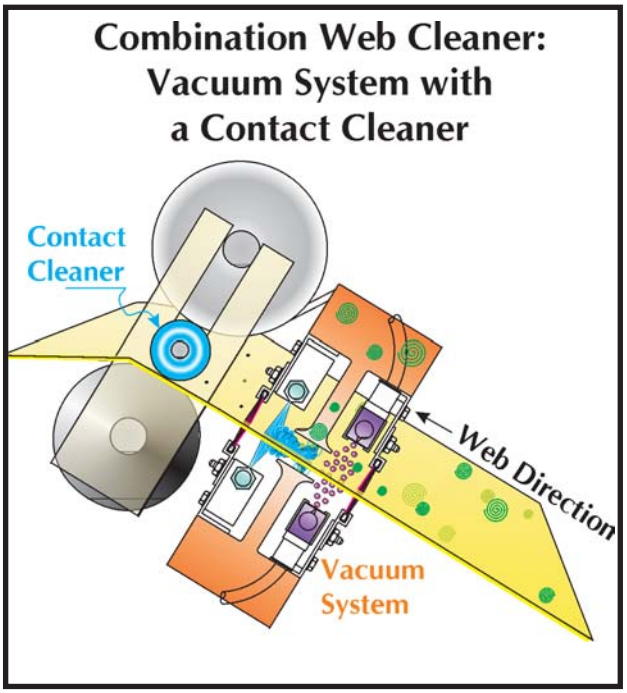




keep manually stripping off layers of the tape roll. Plus, the ongoing cost of replacing the tape rolls can be prohibitive. When these high maintenance costs are combined with the high inital investment required for the popular clam shell style contact cleaner, the cost of maintaininga clean web is substantical.

So, what's the answer? How can printers maintain a very clean web, but at a reasonable cost? Combine the technologies! By combining an efficient vacuum system with a lower cost CCR system you can consistently clean material with minimal maintenance and reduce the consumable costs associated with replacing the adhesive tape cleaning rolls…

INCREASED PRODUCTIVITY + REDUCED COSTS + HIGHER QUALITY PRODUCT = HIGHER PROFITS. The vacuum system will consistently (and cost effectively) remove the larger particles (to approximately 25 microns) leaving the smaller sizes (< 25 micron) for the CCR system to remove. The combination effectively reduces the amount, and size, of contaminant that the CCR must remove, consequently, increasing the level of cleaning efficiency and reducing tape usage



and tape replacement time.
The TRUTH, web cleaning is a complicated effort that if done properly can help you make more money. The CONSEQUENCE, if you don't do it, or don't do it properly, it will cost you customers.