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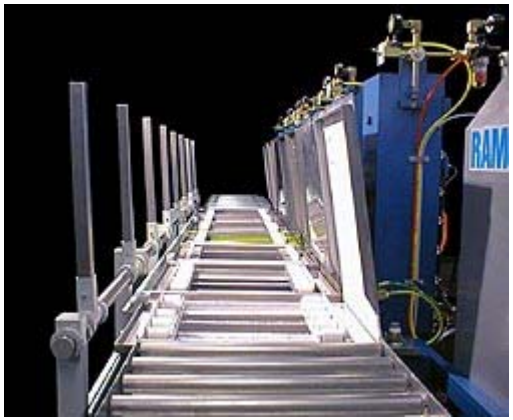
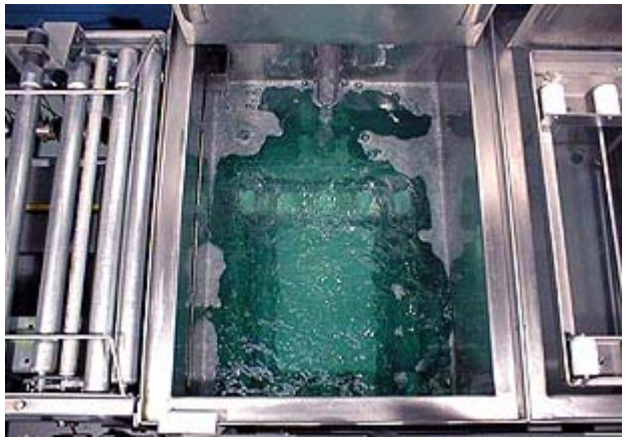
Fully Automatic Dye Penetrant System

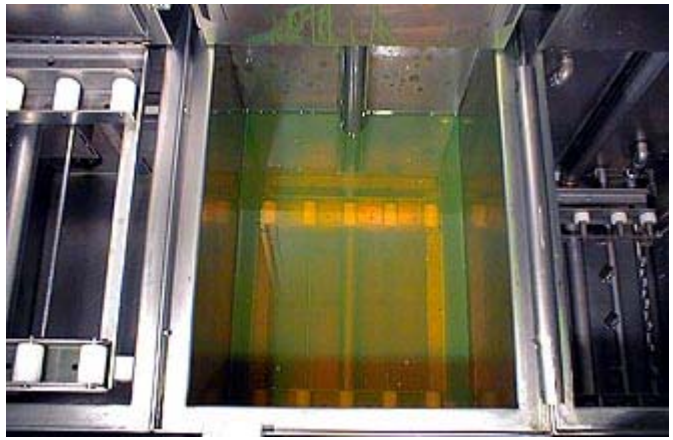
The RAMCO Fully Automatic Dye Penetrant System is a unique process incorporating a number of key attributes distinctive of our expertise. Transport/oscillating elevators are the basic building blocks for each stage. Exclusive RAMCO features including - Multiple Rollover, MultiPort Oscillation, RamTough Automation and new MultiZone Spray System are utilized to produce this breakthrough product. RAMCO can design manual or fully automated systems to accommodate water soluble or oil based penetrant regimes.



The operator loads baskets at the beginning of the line and unloads baskets at the end of the line ready for inspection. A multi zone zero pressure power conveyor is used to pre-stage and feed baskets to the automation system. The entire process is fully automated using RamTough Automation. Each stage is a standard modular RAMCO MK Series Immersion System that has been modified (as required) to fit the process specifications. Automatic opening and closing covers are included on each stage.



Parts are prepared for penetrant coating (see above top and bottom) using an ultrasonic/turbo wash, overflowing DI rinse and hot air knife dryer. The drying stage is important. Any water carried over into the penetrant will contaminate the bath. Furthermore, the temperature of the part(s) entering the penetrant is restricted requiring effective drying at low temperatures. After drying the parts are immersed in a water soluble dye penetrant (below) and allowed to drain under the closed cover for a preset cycle time. Clean dry parts are processed through penetrant application, excess penetrant removal and developer as dictated by the specifications. Water soluble and oil based protocols can be accommodated.

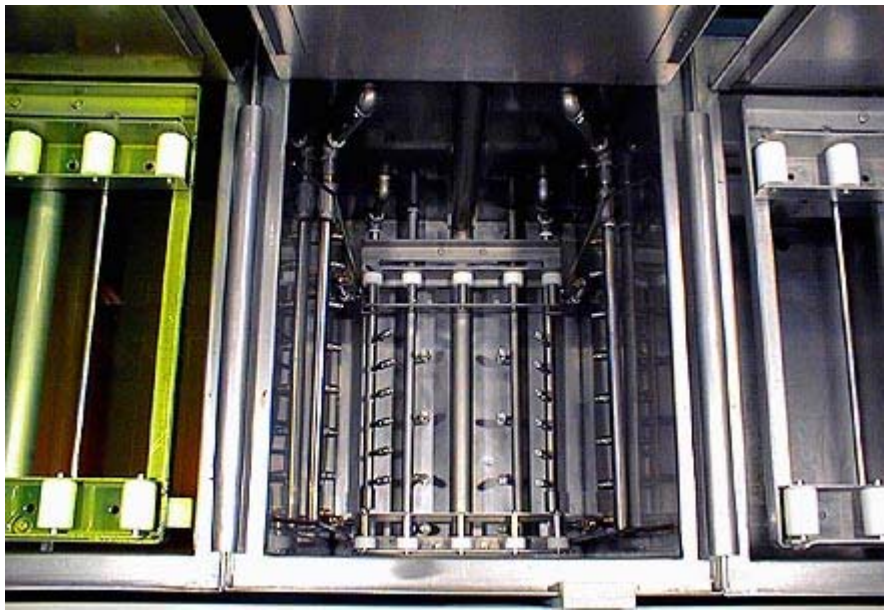


The key to the effectiveness of the system is the accurate removal of penetrant prior to developer application. The penetrant must be thoroughly removed except for that

which reveals any defects in the part(s). Using only water or emulsifier as the cleaning agent at low temperatures the part(s) are thoroughly cleaned but not overwashed. The factor governing this stage are:

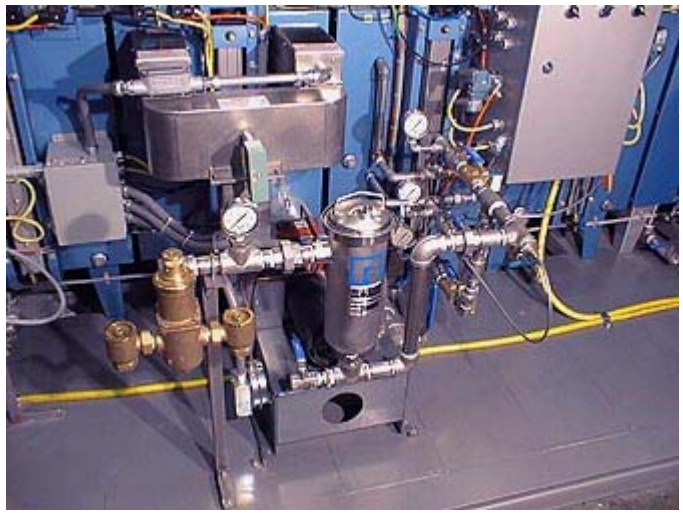
- Temperature
- Flow
- Pressure
- Pattern – stroke/zone
- Time
- Sequence

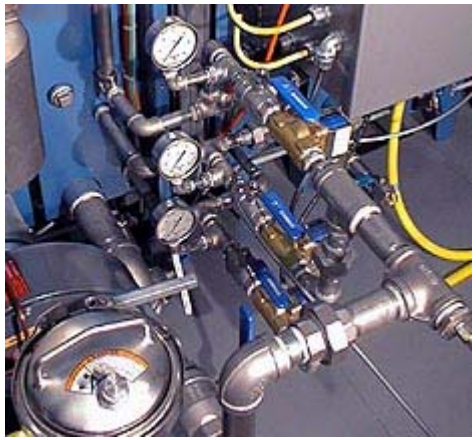
Each variable is accurately controlled within the system. A mixing valve is used to maintain consistent hot water within the limits set by the specifications on penetrant removal. Multiple spray rinsing zones (upper, middle and low) are built within the processing chamber. Each zone has an independent pressure and flow control. Each spray pattern is precisely defined by nozzle types and locations to provide the required coverage as dictated by the specific part(s) and part/basket interface configurations. Basket are custom made to minimize shadowing during spraying. Each zone is pre-selected for long or short stroke oscillation during the cycle.



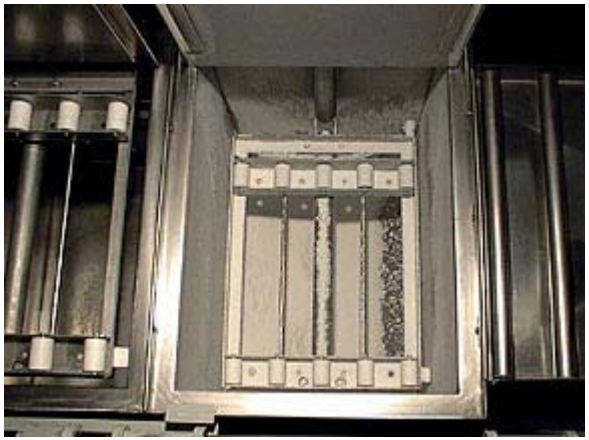
Digital cycle times are used to "fire" each zone for a precise exposure time. The

zones are fired in sequence (top – middle – bottom) and cycled through in multiple "rollovers". Furthermore, the program is sequenced to begin the process in any of the three zones. The water rinse cycle produced is fast, gentle and accurate. It balances all the required variables to thoroughly remove the penetrant and prevent over washing.





After rinsing the parts are dried in a second hot air knife dryer. Finally, the developer is applied in a specially designed hopper shaped chamber. The developer is excited (below) using a compressed air header located at the bottom of the chamber. The stage is timed and adjustable with pressure regulator and header flow control.



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