



MIDWEST PIPE REPAIR™

PROFESSIONAL INTEGRATED MECHANICAL SERVICES

Hydraulic Tube Expansion .. coming of age

MIDWEST PIPE REPAIR presents ..

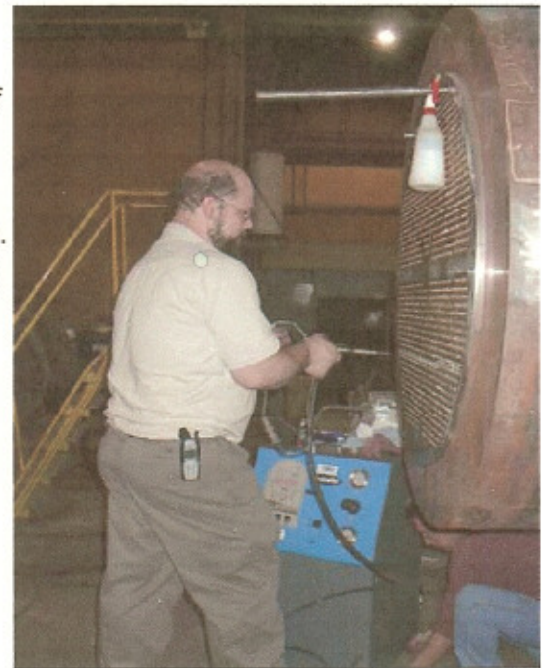
HydroPro Hydraulic Tube Expansion Systems

Hydraulic expansion is the direct application of hydraulic pressure within a tube in order to form a tight joint between the tube and tubesheet in tubular heat exchanger and boiler applications.

The HydroPro hydraulic tube expansion system is the result of more than twenty-five years of innovative high-pressure engineering and field experience. HydroPro systems are designed to expand tubes by directly applying high pressure hydraulics (water) within a tube for the purpose of producing a tight tube-to-tubesheet joint within a preestablished expansion zone



HydroPro Expansion Mandrel Assembly



MIDWEST PIPE REPAIR

ST. LOUIS, MISSOURI

SERVICE PROVIDED

24/7/365

TOLL FREE

1 - 877 - 677 - 6771

WEB SITE

www.MPR1.com

Other MPR products

BoilerPro - Locks boiler tubes into firm tube plate contact prior to full hydraulic, hybrid or roller expanding

TubePro - Locks exchanger tubes into tubesheet prior to welding. Consistently pre-sets tube end protrusion

HydroProof - Hydro-test individual tubes and/or individual tube-to-tubesheet joints prior to full vessel hydro-test.

SleevePro - An economical method of extending the service life of aging or failing heat exchangers or condensers by hydraulically expanding sleeves (or ferrules) into existing tubes.



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Why expand tubes hydraulically?

Hydro-expanding produces a more desirable metal structure than rolling. The metallurgical changes to the granular structural pattern of the tube material is more acceptable when produced by hydro-expanding than that produced by mechanical rolling.

Hydro-expanding produces joints with minimal residual stress and tube damage in the transition zone between the expanded and un-expanded regions of the tube, whereas mechanical rolling tends to produce a sharp transition with high residual stress. This residual stress can result in stress induced corrosion cracking once the unit enters service.

Hydro-expanding with HydroPro permits full depth expansion in one pass regardless of tubesheet thickness.

Precise control of hydraulic pressure and dwell time from the HydroPro system console produces consistently repeatable expansions from tube to tube.

How it works!

A HydroPro expansion mandrel assembly is selected for the tube size to be expanded.

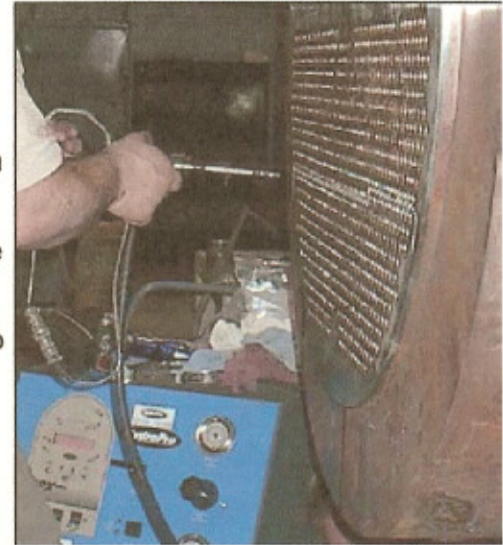


The mandrel assembly consists of two high pressure seal assemblies mounted on a shaft designed to contain the expansion pressure within the desired expansion zone.

The mandrel is then mounted into the service gun and inserted into the first tube to be expanded.

When the button on the service gun is depressed, water from the HydroPro system is pumped through the service gun and mandrel assembly into the preestablished expansion zone.

The panel mounted LED readout allows the operator to follow each step of the expansion process as it occurs. Any failure to achieve expansion pressure or dwell time is identified (on the LED panel) with a red light at the point of failure.



Upon successful completion of the hydro-expanding cycle, the expansion mandrel is removed and inserted into the next tube to be expanded. Total cycle time approximately six seconds.



For more information contact:

Midwest Pipe Repair

Toll Free: 1.877.677.6771

Email: info@mpr1.com



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HydroPro® • Hydraulic expansion of tubes to 60,000 psi.

TubePro® • Hydraulic pre-setting of tubes.

BoilerPro® • Flare & lock 1" to 3" O.D. boiler tubes.

HydroProof® • HydroTest tube joints individually to 2,000 psi.

Tube End Prep • Polish tube O.D. in 10 seconds.

Thickness Gauges • Easy to use U.T. gauges to 9.99".

Portable Torque Testers • Measure torque of rolling motors.

HTP-500® Tube Pullers • Pull tubes full length through gun.

CTP-900® Stub Puller • Pull tube stubs quickly.

Tubing Services • On-site.

Call Us For More Information

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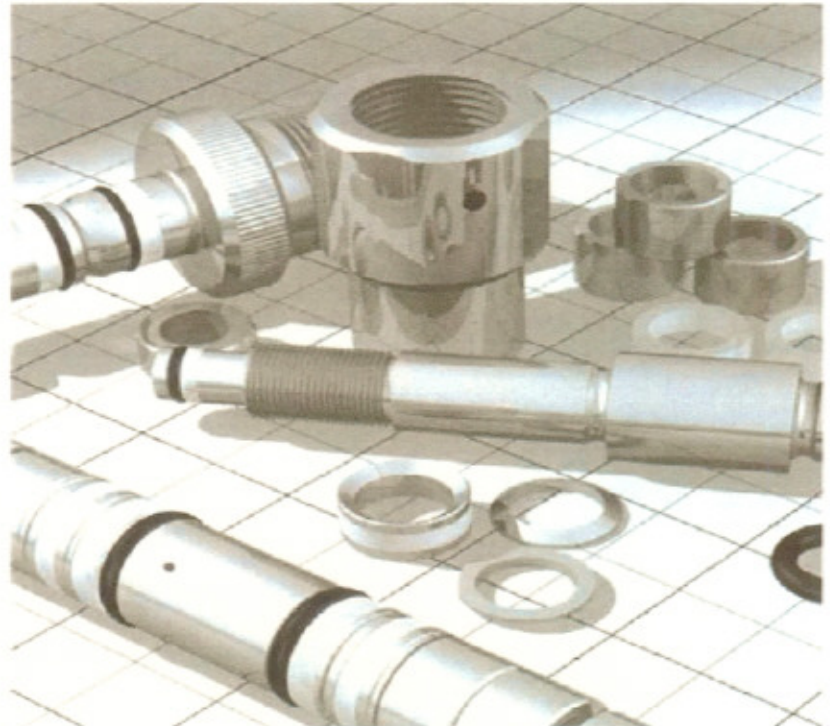
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Tooling

Totally re-engineered concepts have resulted in a unique mandrel design capable of meeting a wide range of industry needs.

The cornerstone of this new mandrel is its revolutionary segment and cam assemblies (patent pending.) During expansion, the segments remain parallel to the axis of the tube, minimizing bending stress. The result is greater strength, longer life, reduced high pressure leakage, and less tube marking than older designs.

Significant improvement in performance of our cams and segments along with ultra high strength alloys are ideal for high pressure applications.



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Tooling

- Interchangability with older design products eliminates the need to scrap current mandrels and shafts.
- Expansion of a wider tube I.D. variation jumps traditional size gaps.
- Fast and easy band and segment replacement increases efficiency and ease of use.
- Standard sizes for tubes from 1/2" O.D. through 2 1/2" O.D.

Tooling Comparisons

HydroPro Standard Tooling

.020" range between sizes.

Heavy-duty cams resist bending.

Parallel expanding segments reduce tube marking.

3/8" to 2 1/2" standard.

Standard 2-Week delivery.

All metal parts are high-strength heat treated alloy stainless steel.

Other Standard Tooling

.010" range between sizes.

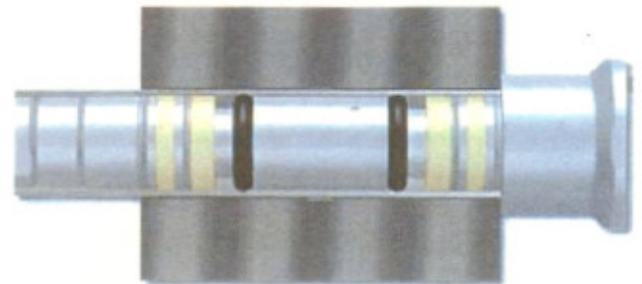
Weak cams can bend and bind on shaft.

One sided expanding segments can dig into tube wall.

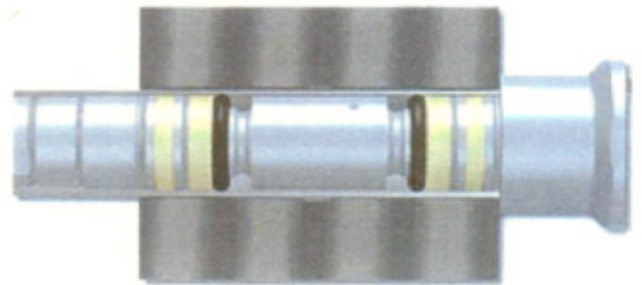
Small and large sizes special.

Up to 12 weeks.

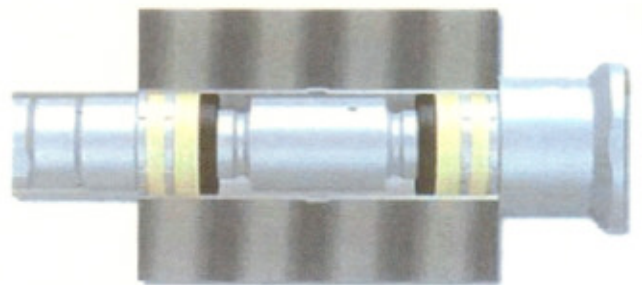
Not in all cases.



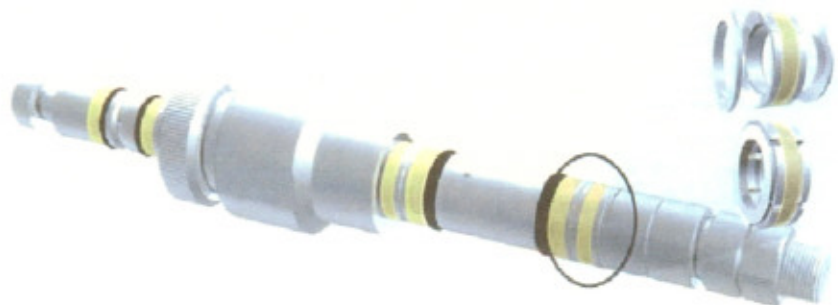
Mandrel Inserted in tube (Static).



Low Pressure (Prefill).



High Pressure (Expansion).



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Hydraulic Expansion vs. Mechanical Rollers 1

Fourteen Comparisons of Hydraulic Expansion vs. Mechanical Rollers

1. Hydraulic expanding, or Hydro-expanding, is an innovation in expanding tubes into tubesheets. It is completely different from roller expanding, whether the tube expanders are driven electrically, by air, or hydraulically.
2. In Hydro-expanding, the degree of expanding is directly related to the preset expanding procedure. The pressure is exactly repeatable and does not vary from tube to tube, no matter what shape the tube is in. But, in mechanical rolling, whether you use torque setting or apparent wall reduction, the degree of expanding cannot be directly correlated. Furthermore, torque controllers measure only the power drawn by the rolls which can vary with the condition of the rolls and mandrel, lubrication, operator fatigue, and other factors.
3. Mechanical rolling reduces the tube wall by; a) stretching the tube radially, and b) imposing high unit rolling forces that cause the tube to extrude axially. Hydro-expanding, however, only stretches the tube radially. The amount of wall reduction is barely measurable and, in fact, the tube end pulls in slightly as the tube is bulged out, rather than extruding.
4. Hydro-expanding produces no surface effects on the tube and almost no work-hardening. You never get bell shaped or hour glass shaped tube ends. Therefore, the tube-to-wall contact is always uniform.
5. When you roller expand tubes into grooved holes, tube metal extrudes into the grooves. But, when you Hydro-expand tubes into grooved holes, the tube bulges into the groove, providing additional tightness at the contact of the groove edges with the tube.
6. Mechanical rolling may cause tube-end fatigue, depending upon the frequency and amplitude of the stresses the rollers apply. The frequency is far more effective in producing fatigue than the amplitude. That is why five or seven roll expanders are used when the tube material is subject to fatigue. From the fatigue standpoint, Hydro-expanding is like having an infinite number of rolls.
7. The high contact stresses imposed by rolling make it more likely that stress corrosion will cause tube-end failure. The transition from the reduced wall is a possible trouble source in rolled tubes.
8. You can Hydro-expand the tubes to the exact rear of the face of the tubesheet, thereby reducing the chance of crevice corrosion at the rear. This is accomplished by the uniformity of pressure being applied to the entire tube length at the same time. With mechanical rolling methods you are pushing the tube material out the rear of the tubesheet and because of this, you create a very noticeable rear crevice, resulting in premature tube failures.



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Hydraulic Expansion vs. Mechanical Rollers....continued

9. The extreme ease of operation of the HydroPro requires no operator feel to accomplish the task properly and training is quick and easy.

10. If rollers cease and stall, the rolling motor may spin and injure a worker. HydroPro returns no rotational forces to the operator and is light weight.

11. To roll tubes into tubesheets thicker than 2", you have to step roll. This is time consuming and requires a tremendous amount of skill. You can Hydro-expand tubes into any thickness of tubesheet with one pass of the mandrel per tube.

12. When you re-roll leakers after hydro-testing, you further reduce the tube wall. Also, you may move the ligaments enough to start other leaks and may even cause ligament damage around the other tubes. This can also create problems in having to chase the leaks completely around the tubesheet, creating problems, and so on. With Hydro-expanding, because you can accurately control the exact expansion pressure, you can eliminate the problem of having to re-expand leakers. If you do have a leaker, you know exactly which pressure will provide a seal without disturbing any of the adjacent holes.

13. Expansion time depends on the tube material and averages 2 to 5 seconds per tube. Only one worker is needed to do the work. Tube ends are prepared in the same way as for roller expanding. Note that tubes that would tear up rolls and cages or break mandrels will damage and/or reduce the life of o-rings and back-ups.

14. Hydro-expanding is successful in out-of-round holes and in holes distorted by tube plugging. However, axial scratches in the hole or tube material will cause leaks in any expanded tubeto- tubesheet joints, regardless whether expanding by rolling, near contact explosions, compressed rubber expansion, or hydro-expanding. Therefore, it is recommended that scratched holes be burnished free of axial scratches or a groove be cut into the tubesheet. It might be further noted that because of the uniformity of hydraulic expansion, it does further reduce the probability of axial scratches when retubing. The extraction of hydro-expanded tubes will be extremely even and uniform, thereby producing cleaner tube holes ready for re-tubing.