

IN OUR 73rd YEAR



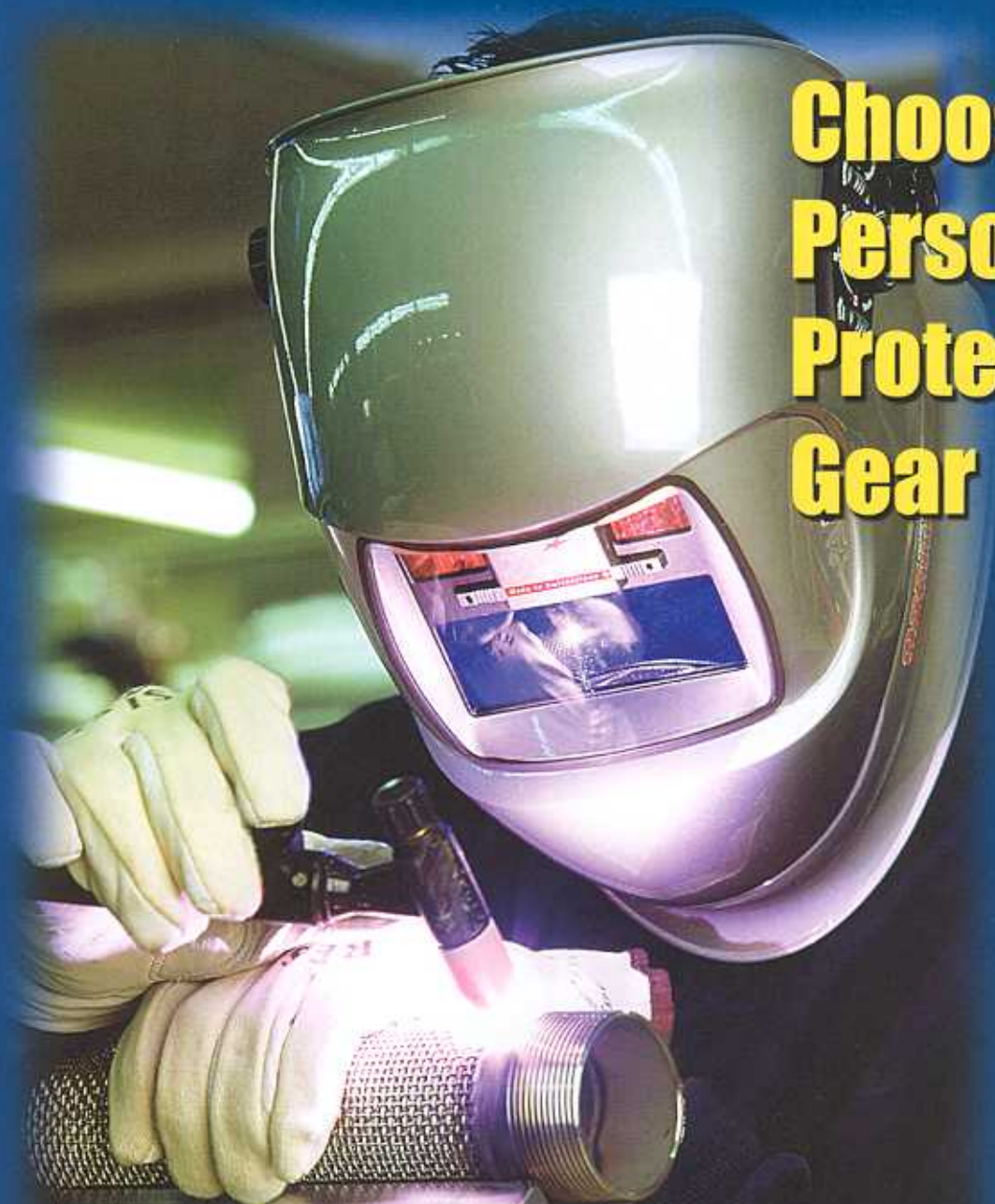
WELDING DESIGN & FABRICATION

The International Magazine of Welding and Fabricating Technology

MAY 2004

A PENTON PUBLICATION

Choosing Personal Protective Gear



*****AUTO**3-DIGIT 480
WX 002 200 PLT 3



KEN JOHNSON, LICENSING EXECUTIVE
DELPHI TECHNOLOGIES
M/C 483-400-404
5725 DELPHI DRIVE
TROY

MI 48098-2815

AWS Show Review

Totally Tubular Welds



Annular-deformation-resistance welding (ADRW) simplifies tube joining. Right: on the two tubes with mating flanges; Left are the two parts and an ADRW-processed part.

Shops can easily weld metal tubes to solids, sheetmetal, and other tubes thanks to a new resistance-welding method developed at Delphi Corp., Troy, Mich. Annular-deformation-resistance welding (ADRW) creates leak-tight joints with uniform circumferential weld strength. Reportedly, it also reduces part cost and weight compared to conventional welding or brazing techniques.

Dr. Anthony Ananthanarayanan, technical fellow for welding, Delphi Energy & Chassis Systems, working with partner, Desi Herbst, senior manufacturing engineer, originally devised ADRW for manufacturing automotive fuel-system components.

The process creates joints through the

deformation and displacement of a nugget material at the interface of the two parts — welding metal tubes to any type of part including solids, sheetmetal stampings, and other tubes of different diameters and configurations or at various angles.

For a tube-to-tube application, with one tube having a smaller, closely fitting O.D. that inserts lengthwise into the other tube, the ADRW-preparation process works as follows: The larger-diameter tube has a flange at its end, providing a flat surface. The smaller-diameter tube has a fold around its diameter away from its end. This fold, made by an upsetting process, mates with the other tube's flange when the tubes are fitted together.

Annular electrodes are placed on the fold and the flange surrounding the tubes' circumferences. Electrodes then apply heat and pressure to the area, resistance welding them together. These electrodes are application-specific and promote sliding of the mating tubes along their length during welding, resulting in effective solid-state bonding.

Delphi found conventional resistance welding less expensive than other welding methods. In addition, says Ananthanarayanan, "Part fit-up doesn't have to be precise, the process-cycle time is significantly reduced, filler metal needn't be used, and yields are higher."

Dharam Ramachandra, project manager, chassis-modules, Delphi Energy and Chassis Systems, says the company also expects the process to significantly reduce the weight and cost of chassis members, without sacrificing their structural integrity.

ADRW allows tubes to be welded into T joints, even ones of equal and unequal size. Tubes can be made of various metals, including 300 and 400-series stainless steels and nickel-based alloys, and their cross-sectional shapes can be rectangular, teardrop, hexagonal, square, and oval. The process is also scalable to fit tube diameters ranging from 0.25 to 6 in.; however, Ananthanarayanan believes that bigger diameters are possible.