UT inspection of complex shape pipes for Oil & Gas applications

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As a seamless steel pipe manufacturer, Vallourec has recently been launching an increasing number of products called “complex shape pipes” or “shaped pipes”. These tubular products have inner and/or outer diameter(s) that vary along their axis. These local variations in shape can be created either by use of a press followed by a machining step, or through a forging process. Those specific products require dedicated UT inspections in order to detect any surface defect, or any delamination, that may be present. Indeed, the presence of the slope(s) requires correcting the emission angle of the ultrasonic beam accordingly to keep a constant incidence angle on the defect, in order to have a satisfying signal-to-noise ratio. Also, the changing wall-thickness (WT) impacts the time-of-flight of the indications, which requires moving the detection gate(s) accordingly. Finally, the changing WT impacts the signal amplification level (gain) required to keep the sensitivity of the control constant, for example to detect only surface defects with a depth of at least 5% of the local WT. For the past few years, Vallourec has been developing both manual and semi-automatic UT controls able to achieve reliable inspections of shaped pipes. These controls, which rely both on mechanical and electronic technical solutions, are presented in this paper.