WEDNESDAY, June 22

8:30 a.m. - 10:00 a.m. Room A
SMS-15: Self Repair of Matrices
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Self repair of matrices has received much attention. It is an enabling technology for both the ceramics and polymer industries. However each application must be tested and designed for each set of circumstances. This paper will discuss the various application under consideration and the main mechanical engineering issues involved. Applications include self repair of vehicles, infrastructure and consumer goods and the issues are survival under processing conditions, end use conditions and the efficiency of repair for the environmental insult damage which is to be repaired.

8:30 a.m. - 10:00 a.m. Room B
PLF-07: Metal Forming Analysis of the Muffler Tube in the Perforating Process
K.T. HAN, Pukyong National University,
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Recently there has been a growing interest in the design and manufacturing of the muffler tube due to the strict environment regulations. A muffler is an important part used to reduce noise and to purify exhaust gas in cars and heavy equipment. The shape of the muffler tube and the number of the tube hole has been made variously according to the weight and function of the car. The perforating technique of the muffler tube has a great influence on the manufacturing cost. In this study, metal forming analysis has been carried out to investigate the perforating process for the muffler tube and predict an optimal forming condition of the muffler tube. Also its simulation results by the finite element method were reflected to the die design and the manufacturing system for the muffler tube. The perforating process is performed in the longitudinal direction of the tube. According to the simulation results, when the shear angle of punch was similar to the tube curvature, the optimal shape was obtained. Also when the clearance of die was 0.2mm, the burr was minimized and optimal shear section was obtained.

WEDNESDAY MORNING, June 22

8:30 a.m. - 10:00 a.m. Room A
SMS-17: (Crack-healing + Proof Test): A New Methodology to Guarantee the Reliability of a Ceramics Component
M. ONO, W. NAKAO, K. TAKAHASHI, K. ANDO, Yokohama National University; M. NAKATANI, NHK SPRING Co., Ltd,
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Combination of crack-healing and proof-test is proposed as a new methodology to guarantee the reliability of a ceramics component, because crack-healing and proof test are effective techniques to overcome surface cracks and embedded flaws, respectively. In this study, the effect of crack-healing on the Weibull distribution was investigated for alumina/SiC particle composite which has excellent crack-healing ability. Characteristic strength of the crack-healed specimens was increased 2.4 times that of as-cracked specimen. Moreover, the minimum guarantee fracture stress at high temperature for the specimens proof-tested at R.T. after crack-healing was estimated. The fractures stress of the proof-tested specimens at elevated temperature was also measured at elevated temperature. From this result, minimum fracture stress at high temperature was determined. Calculated minimum fracture stress agreed well with the values measured by experiments. Therefore, it is concluded that the combination of crack-healing and proof-test is the effective techniques to guarantee of the fracture stress at high temperature of the ceramics component.

SMS-18: [Crack-healing+Proof Test+In-Situ Crack-Healing]: A New Methodology to Guarantee the Structural Integrity of Ceramic Components
K. ANDO, K. TAKAHASHI, K. FURUSAWA, W. NAKAO, Yokohama National University,
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Recently, the authors developed Si$_3$N$_4$, Al$_2$O$_3$ and Mullite ceramics with good self-crack-healing abilities. It was shown that the optimized crack-healing condition to get high temperature strength was: 1573K, 1 h, in air, and the heated zone exhibited the same strength as the base material. Using this good healing ability, a new methodology to guarantee the reliability of ceramic components "crack-healing + proof test" was proposed. However, if a crack initiated during service, reliability would be severely impaired. Therefore, if a material can crack-heal during service, and if the heated zone has enough strength at the temperature of healing, it would be very desirable for structural integrity. From the above points of view, a new methodology to guarantee the structural integrity of ceramic components using in-situ crack-healing ability was proposed and the usefulness was discussed using the test results in terms of crack-healing behavior and proof test theory by the authors.

PLF-08: Clarification of Twist Occurring in Curved Hat Channel Product of High Strength Steel Sheet
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This paper deals with twist occurring in two kinds of hat-channel product made from high-strength steel sheet. The product consists of a curved portion and a straight portion in the longitudinal direction. One (2D type) has curvature on the horizontal plane, and the other (3D type) has additional curvature on the vertical plane. Twist in the longitudinal