The paper focused on the feasibility of substituting the ordinary Portland cement with waste supplementary cementing materials (SCMs) that is, fly ash (FA) and silica fume (SF). The aim is to improve the com- pressive strength of self-compacting high-performance concrete (SCHPC) and to find environmentally friendly and economical application of the abundant FA generated from the four coal-powered electricity generating plants in Malaysia. To this end, the study examined the effects of FA and SF on fresh properties and compressive strength of SCHPC. The study used SCHPC with partial replacement of Portland cement with ASTM C618 class F FA and SF in exploring the fresh properties and compressive strength of six dif- ferent SCHPC mixes. The mixes contained 0%, 25%, 40%, 50%, 65% and 75% cement replacement by FA, SF was maintained at 10% constant replacement. The water/binder (w/b) ratio was fixed at 0.31 for all the mixes. Tests on fresh concrete such as Slump flow, L-Box, and V-funnel were conducted to assess the fresh properties of the SCHPC. Compressive strength test was determined on 100 mm2 concrete cubes at 7- and 28-days curing ages. The results of slump flow, passing ability, and viscosity of SCHPC satisfied the requirements of the Specification and Guidelines for Self-Compacting Concrete (EFNARC). The blend of 40% PC, 50% FA, and 10% SF achieved a maximum compressive strength of 87.06 MPa at 28 days curing age. This result is 5% higher than the control specimen, which has a compressive strength of 82.39 MPa. Selection and peer-review under responsibility of the scientific committee of the International Confer- ence on Aspects of Materials Science and Engineering.