This paper studies the characteristic properties of Engineering Design (ED) processes from a process modelling perspective. In a first step, we extracted nine characteristics of engineering design processes from the literature and in a second step validated the findings using results from our survey among academic and industrial ED process modelling experts. In a third step, we added a further nine characteristics from personal experiences in the Language Engineering Domain to capture the pragmatic perspective. We arrive at a comprehensive set of 18 characteristics grouped into 6 challenges for process modelling in the engineering design domain. The challenges process modelers need to address when using and developing process modelling approaches and tools are: Development, Collaboration, Products & Services, Formality, Pragmatics, and Flexibility. We then compare the importance of elicited and suggested challenges and characteristics within engineering design with software engineering and business process modelling and discuss similarities and differences.