

1095. 3. e. 2. Technology "required" for the "production" of specially designed components, as follows, for high output diesel engines:
- a. Technology "required" for the "production" of engine systems having all of the following components employing ceramics materials embargoed by 1013.7:
    1. Cylinder liners;
    2. Pistons;
    3. Cylinder heads; *and*
    4. One or more other components (including exhaust ports, turbochargers, valve guides, valve assemblies or insulated fuel injectors);
  - b. Technology "required" for the "production" of turbocharger systems, with single-stage compressors having all of the following:
    1. Operating at pressure ratios of 4:1 or higher;
    2. A mass flow in the range from 30 to 130 kg per minute; *and*
    3. Variable flow area capability within the compressor or turbine sections;
  - c. Technology "required" for the "production" of fuel injection systems with a specially designed multifuel (e.g., diesel or jet fuel) capability covering a viscosity range from diesel fuel (2.5 cSt at 310.8 K (37.8°C)) down to gasoline fuel (0.5c St at 310.8 K (37.8°C)), having all of the following:

1. Injection amount in excess of 230 mm<sup>3</sup> per injection per cylinder;
2. Specially designed electronic control features for switching governor characteristics automatically depending on fuel property to provide the same torque characteristics by using the appropriate sensors;
3. Technology "required" for the "development" or "production" of high output diesel engines for solid, gas phase or liquid film (or combinations thereof) cylinder wall lubrication, permitting operation to temperatures exceeding 723 K (450°C), measured on the cylinder wall at the top limit of travel of the top ring of the piston.

**Technical Note:**

High output diesel engines:

Diesel engines with a specified brake mean effective pressure of 1.8 MPa or more at a speed of 2,300 r.p.m., provided the rated speed is 2,300 r.p.m. or more.

**NOTE:**

Governments may permit, as administrative exceptions, the shipment of marine gas turbine engines embargoed by 1091.2., for installation in civil marine vessels for civil end-use, provided their specific fuel consumption exceeds 0.23 kg/kWh and their continuous ISO rating is less than 20,000 kW.

**STATEMENT OF UNDERSTANDING**

It is understood that 1095.3.e.2.b. embargoes only technology "required" to achieve all of the parameters.

It is understood that 1095.3.e.2.c. embargoes only technology "required" for multifuel capability with all of the parameters.