CLAIMS

1. A method of improving a lubrication system of a large slow running engine,

wherein the engine comprises a cylinder (1) with a reciprocal piston inside and with a plurality of lubricant injectors (4) distributed along a perimeter of the cylinder (1) for injection of lubricant into the cylinder (1) at various positions on the perimeter during injection phases;

wherein the lubrication system is configured for providing lubricant to the injectors (4) in the injection phases; wherein the lubrication system comprises a lubricator (11) for being pipe-connected to each injector (4) by a lubricant feed conduit (9) for providing pressurized lubricant to each injector (4) though the lubricant feed conduit (9) in the injection phases;

wherein the lubricator (11) comprises a housing (101) in which a hydraulic-driven actuator piston (123) is arranged reciprocal along a stroke length,

wherein the housing (101) further contains a plurality of injection plungers (119) and a corresponding plurality of dosing channels (115) as well as non-return valves (102), one for each dosing channel (115), each injection plunger (119) being slidingly arranged in one of the dosing channels (115), wherein the injection plungers (119) are coupled to the actuator piston (123) in order to be moved in common by the actuator piston (123) over the stroke length and as a consequence pressurize lubricant in the dosing channels (115) over a dosing channel distance for expelling the pressurized lubricant from each dosing channels (115) through the corresponding non-return valve (102) for injection of the lubricant into the engine cylinder (1); wherein the dosing channel distance defines the volume of lubricant expelled from the dosing channel (115) through the non-return valve (102) during the injection phase;

wherein each non-return valve (102) is provided in a corresponding valve-chamber (102') in the housing (11) and comprises a valve-member (23) pre-stressed against a valve-seat (24) by the load of a spring (25);

characterized in that the method comprises removing the spring (25) and valve member (23) from the valve chamber (102') and modifying the valve-seat (24) in the valve-chamber (102') by forcing a deformation member (32, 32', 32'') into the valve-seat (24) and causing plastic deformation of the valve-seat (24) for

improving dimensional precision of the valve seat by the deformation member (32, 32', 32''); re-fitting the valve member and the spring after modification of the valve-seat; subsequently operating the lubricator (11) for the lubrication system of the engine with the modified valve-seat (24).

2. A method according to claim 1, wherein the modification comprises providing a circular symmetric deformation member (32, 32', 32'') and deforming the valve-seat into a circular symmetric shape by forcing the deformation member (32, 32', 32'') into the valve-seat (24).

3. A method according to claim 2, wherein the circular symmetry varies by less than 0.2 mm when measured across the valve seat (24).

4. A method according to any preceding claim, wherein method comprises providing a deformation member (32, 32', 32'') with a surface roughness smaller than the surface roughness of the valve seat (24); and wherein the deformation comprises forcing the deformation member (32, 32', 32'') into the valve-seat (24) at a force that causes reduction of surface roughness of the valve-seat (24) for tight contact between the valve member (23) and the valve set (24).

5. A method according to claim 4, wherein the method comprises reducing the surface roughness of the valve seat (24) to less than 12.5µm by the deformation with the deformation member (32, 32', 32'').

6. A method according to ~~any preceding~~ claim 2 or 3, wherein the deformation member (32, 32', 32'') is either A or B, wherein

A) the deformation member (32, 32') is convex with a first radius of curvature and the method comprises modifying to the valve-seat (24) to attain this first radius (34) of curvature, wherein the first radius of curvature (34) is measured in a plane orthogonal to the valve seat (24); wherein the method comprises loading a valve member (23) into the valve chamber (102') for tightening against the valve-seat (24) along a circular ring after modification of the valve-seat (24), wherein the valve member (23) is provided with a second radius of curvature (33) equal to or smaller than the

first radius of curvature (34) when measured in a plane orthogonal to the valve seat (24);

B) the deformation member (32'') is conical and the method comprises modifying to the valve-seat (24) to attain this conical shape.

7. A method according to claims 6, wherein the first radius of curvature is 5-50% larger than the second radius of curvature.

8. A method according to any preceding claim, wherein the modification comprises deformation of the valve-seat (23) into a part-spherical shape by forcing a spherical deformation member (32) into the valve-seat (23) at a force causing mechanical deformation of the valve-seat (23) from a non-spherical shape into a part-spherical shape.

9. A method according to any preceding claims, wherein the method comprises operating the lubricator (11) in the lubrication system for at least 100,000 lubrication injection cycles prior to the modification, and continuing operation of the lubrication system with the lubricator (11) and the modified valve-seat (24) after the modification.

10. A method according to any preceding claim, wherein the method comprises operating the lubrication system by feeding lubricant to the injectors with the modified lubricator (11) at a lubricant pressure in the range of 20-100 bar and injecting a mist of atomized droplets of lubricant by the injectors into swirling scavenging air inside the engine cylinder and distributing the droplets onto the cylinder wall during transport of the droplets by swirling motion towards the top dead centre, TDC, of the cylinder.

11. A method according to any preceding claim, wherein the method comprises operating the lubrication system with the lubricator (11) and the modified valve-seat (24) after the modification at a lubricant pressure in the range of 20-100 bar in combination with SIP injectors, injection a mist of atomized droplets of lubricant by the SIP injectors into swirling scavenging air inside the engine cylinder and distributing

the droplets onto the cylinder wall during transport of the droplets by swirling motion towards the top dead centre, TDC, of the cylinder.

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