Company Name : ~~MARKS Engineering~~

Engineering /Mfg. Location :

Customer Name : ~~ZF~~

Model year / Platform :

Subject :

PFMEA Start Date :

PFMEA Revision Date :

Process Failure Mode & Effects Analysis :

(P FMEA : AIAG – VDA 1st edition 2019)

Note : Different types of templates are suggested by the AIAG-VDA version. This template is one among them.

PFMEA ID Number :

Process Responsibility :

Confidentiality level : Not Confidential / Confidential, but may be shared if demanded / Highly Confidential & will not be shared

Cross – Functional Team

Timing :

Tool :

II. STRUCTURE ANALYSIS

1. Process item (System, Subsystem, part element or Name of Process)	2. Process step station no. and name of focus element	3. Process work element 4M type
A	B	C
Input source : PFD Process Description	Input source :	Input source :
THP602030 Burnishing Process	OPN # 40 Burnishing the Main Bore	① Burnishing tool ② Fixture ③ Bore input Condition ④ Cutting Lubricant

III. FUNCTION ANALYSIS

1. Function of the process item function of system, subsystem, Part element or process	2. Function of the process step and Product characteristic (Quantitative value is optional)	3. Function of the process work element and Process characteristic
(A →) D	(B →) E	(C →) F
Input source :	Input source :	Input source :
Process function : (How this component / sub-assembly, final assembly – being produced by you will help next stage to perform ?) To acheive the main bore size & finish as per print requirment **Product function :** (How this component / sub-assembly, final assembly – being produced by you will help the next level item to perform ?) To ensure life of the Piston and meet the Primary fuction of the product	① Surface finish requirment Ra 0.7 Maximum ② Bore size ϕ92.025/92.10 ③ Bore Ovality allowed Maximum 0.03 mm ④ Bore tapper allowed Maximum 0.03 mm ⑤ Visual free from Dent & Damages	① Input Condition bore size ϕ92.04/92.07 ② Input Condition bore Ra 1.2 Maximum ③ Coolant Pressure 15 Bar ④ Burnising tool entry Radius 2.0 Min. ⑤ Burnishing tool roller length 30mm/40mm

IV. FAILURE ANALYSIS

1. Failure effects (FE) to the next higher level element and/or End user	Severity (S) of FE	2. Failure Mode (FM) of the Focus element	3. Failure Cause (FC) of the work element
(D →) G	H	(E →) I	(F →) J
Input source :		Input source :	Input source :
AT MARKS:- M.Hsg # THP602030 may have to be shorted and a portion (<100%) scrapped. Deviation from Primary process. Decreased Line speed or added manpower	7	① Surface finish observed more than Ra 0.7 ② Surface finish observed particular area more than Ra 0.7	① Cutting speed variation ② Cutting feed variation ③ Burnising tool life exceed ④ Input material hardness ⑤ Input material stock not within ϕ92.04 ϕ92.07
SHIP TO ZF :- Line shutdown from 1 hr up to full production shift. Stop shipment possible. Replacement required	7	④ Bore ovality observed more than 0.03mm	
END USER (Field):- Degradation of Primary vehicle function necessary for normal driving expected service life.	7	⑤ Bore ovality observed entry area only more than 0.03mm ⑥ Bore Tapper observed more than 0.03mm	⑥ Input material bore Ra 1.2 more than ⑦ Burnishing operation carring along with burrs

V. RISK ANALYSIS

Current 'Prevention' Control (PC) of FC	Occurrence (O) of FC	Current 'Detection' Control (DC) of FC or FM	Detection (D) of FC/FM	PFMEA AP	Special Characteristics
K	L	M	N	O	P
① CNC Program Lock available	3	① Display available & also in tool layout sheet	6	M	
② "	3	② "	6	M	
③ "	3	"	6	M	
④ No control	10	④ As per Incoming inspection Sampling Plan	6	H	
⑤ No control	10	⑤ As per Periodic Sampling Plan inspection	6	H	SC
⑥ No control	10	⑥ " "	6	H	
⑦ Thru coolant Pressure less than 15 bar, M/c not running the particle operation	3	⑦ Display Available	6	M	

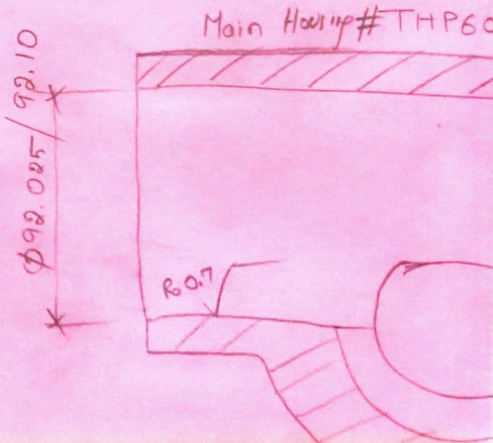
Rec. action: Prevention Action	Rec. action: Detection Action	Responsible person's name
Q	R	S
100% Probing during process itself. Any unnormal M/c stop.	100% Dechect before burnishing Alarm Indicator	

Tutor's evaluation : (1 as least

- Suitability of the project case t
- Discussions made by the team
- Detailing of the project case : 1
- Team discipline (Punctuality / I
- Over all contribution and learni

Comm

New Learning Points:-

① Easily identified, Input Condition of operation, identified no prevention control and also detection not effective (K & M)

② Gemba walk analysis will helpfull for identify more causes (J)