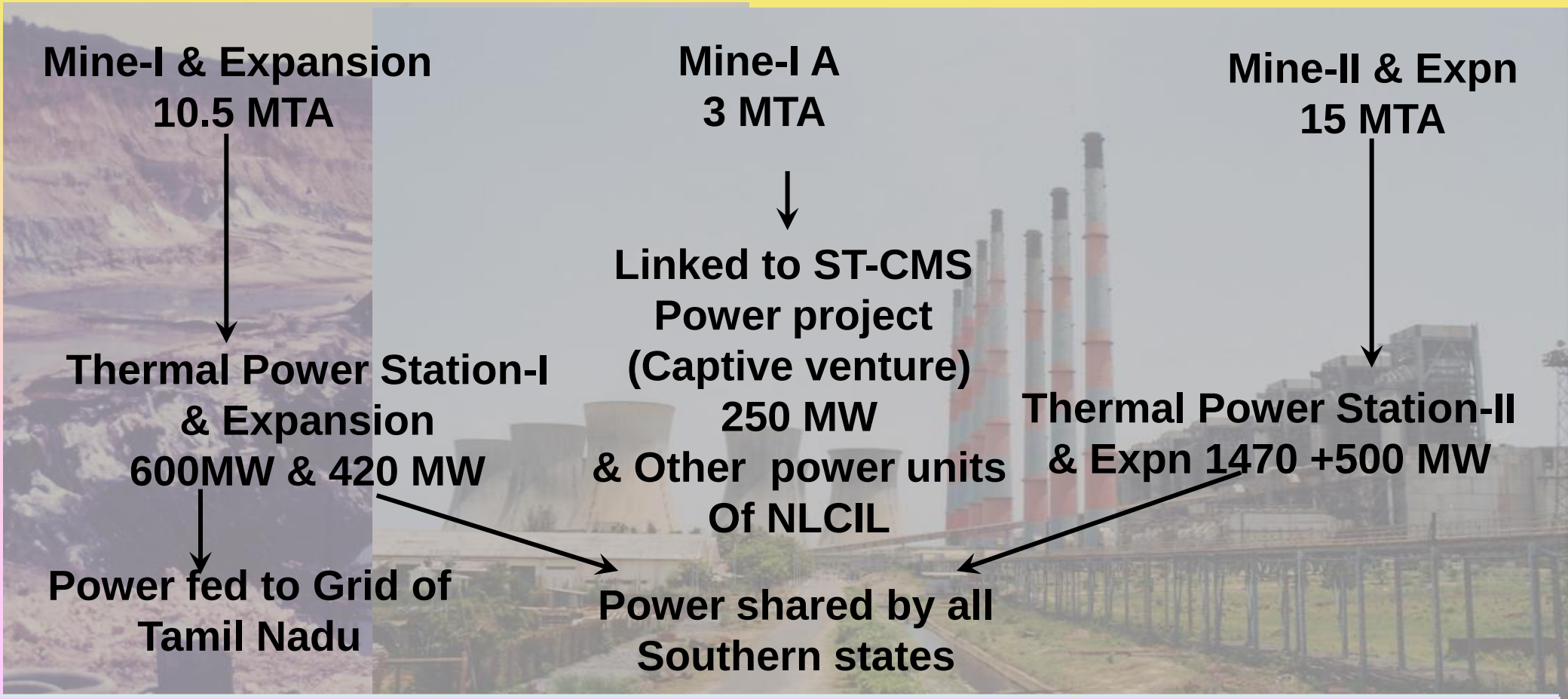
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

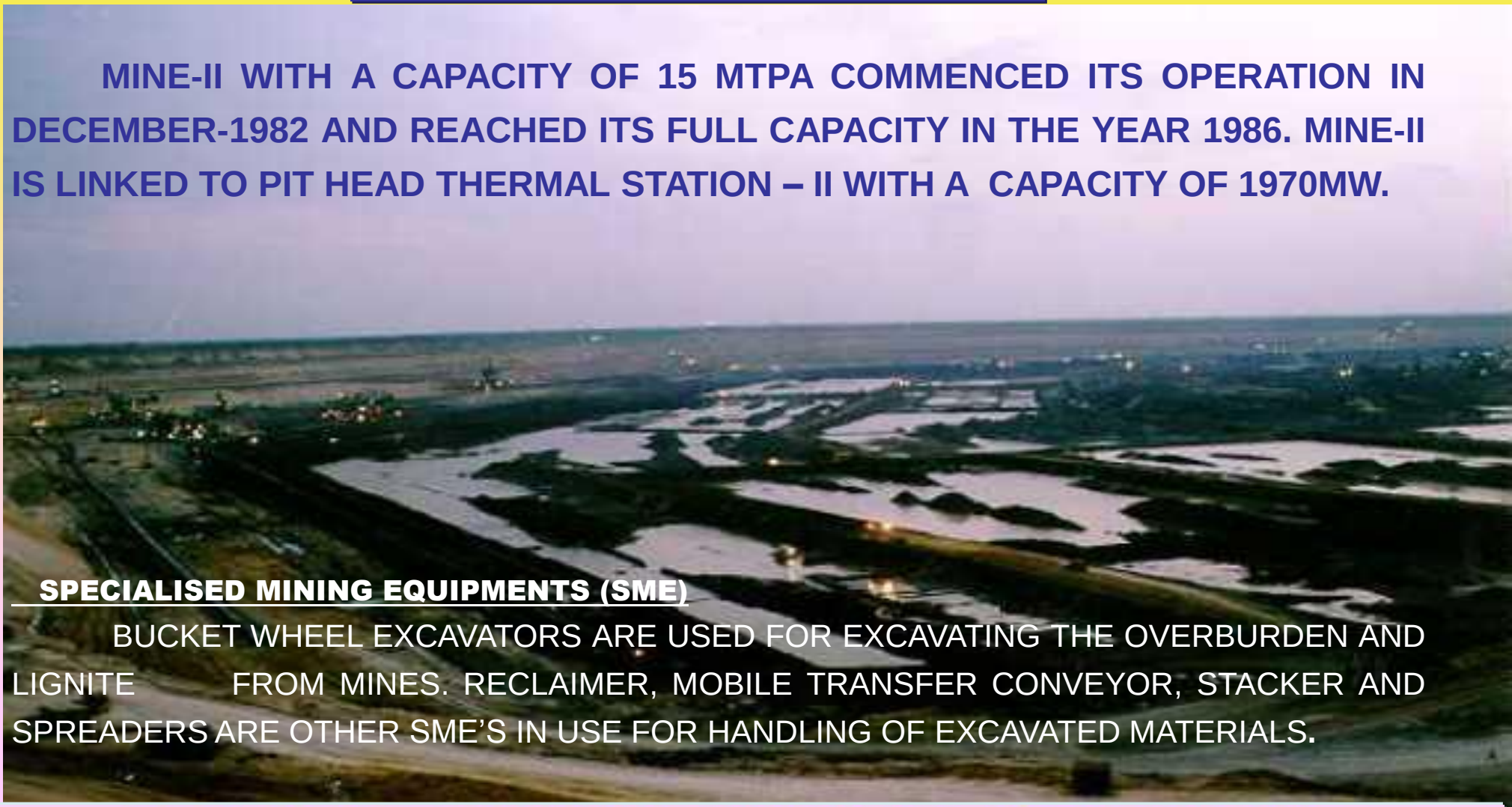
NLCIL is a "NAVA RATNA" Public sector undertaking with three lignite open cast mines with a capacity of 24 million tonnes/annum linked to four pithead thermal power stations of capacity 2990 MW.



MODIFICATION PROCESS OF TRACK TENSIONING IN SME

ABOUT OUR MINE-II

MINE-II WITH A CAPACITY OF 15 MTPA COMMENCED ITS OPERATION IN DECEMBER-1982 AND REACHED ITS FULL CAPACITY IN THE YEAR 1986. MINE-II IS LINKED TO PIT HEAD THERMAL STATION – II WITH A CAPACITY OF 1970MW.



SPECIALISED MINING EQUIPMENTS (SME)

BUCKET WHEEL EXCAVATORS ARE USED FOR EXCAVATING THE OVERBURDEN AND LIGNITE FROM MINES. RECLAIMER, MOBILE TRANSFER CONVEYOR, STACKER AND SPREADERS ARE OTHER SME'S IN USE FOR HANDLING OF EXCAVATED MATERIALS.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

ABOUT OUR WORKING PLACE

MINE-II

SPECIALISED MINING EQUIPMENTS (SME)

BUCKET WHEEL EXCAVATORS ARE USED FOR EXCAVATING THE OVERBURDEN AND LIGNITE FROM MINES.

WORKING ENVIRONMENT

BUCKET WHEEL EXCAVATORS ARE CONTINUOUSLY WORKING IN MINES AREA AT DIFFERENT ENVIRONMENT CONDITIONS (SLUSHY AREA, ABRASIVE SOIL, HARD STONE AND MARCASITE).

STRUCTURALS :

THE MAIN PARTS OF THE BWE ARE BUCKET WHEEL, ROTARY PLATE, BUCKET WHEEL BOOM AND DISCHARGE BOOM WITH CARRYING, IMPACT, RETURN AND PRESSURE ROLLERS.

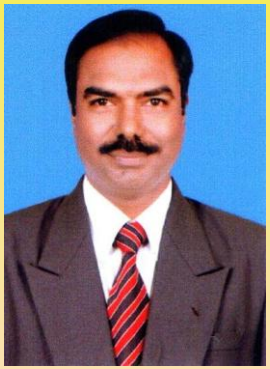
OUR PROFILE

DATE OF INAUGURATION	**: 08.09.1994**
NUMBER OF PROBLEMS TAKEN	**: 82**
NUMBER OF PROBLEMS SOLVED	**: 81**
MEETING ON	**: ALT. THURSDAYS**
TIME	**: 12.40 - 13.20 P.M.**
ATTENDANCE	**: 95%**
MEETINGS HELD IN 2018	**: 18**

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

OUR TEAM

FACILITATOR



K. BALAMURUGAN

MEMBER

G. RAJASEKAR

LEADER

S. TAMILVANAN

MEMBER

D. SUNDARARAJAN

Dy. LEADER

L. RAJAGOPAL

MEMBER

R. SOWANDARARAJAN

NLC INDIA LIMITED. NEYVELI. TAMILNADU.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 1

IDENTIFICATION OF PROBLEMS

BRAIN STORMING

BRAIN STORMING SESSIONS WERE CONDUCTED TO IDENTIFY VARIOUS WORK RELATED PROBLEMS IN OUR AREA. 52 PROBLEMS WERE IDENTIFIED BY OUR TEAM. THESE PROBLEMS WERE CATEGORISED IN TO A,B,&C.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PROBLEM IDENTIFICATION

SL. No.	PROBLEMS IDENTIFIED	CATEGORY
1	PROBLEMATIC SPILLAGE GUARD ADJUSTMENT WORKS IN SPECIALISED MINING EQUIPMENT.	A
2	FREQUENT DISLOCATION OF HOPPER BELTS IN SPECIALISED MINING EQUIPMENT	A
3	PROBLEMATIC BUFFER DOOR BELT CHANGING WORKS IN SPECIALISED MINING EQUIPMENT	A
4	MORE SOIL SPILLAGE IN TURNTABLE AREA OF BUCKET WHEEL EXACAVATOR.	B
5	PROBLEMS FACED IN RETURN ROLLERS CHAIN CUT	A
6	RING CHUTE-CHOCKING PROBLEM IN BUCKET WHEEL EXACAVATOR.	B
7	DIFFICULT APPROACH TO REACH THE DB WHILE THE MACHINE IN DEEP CUT OPERATION.	B

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PROBLEM IDENTIFICATION

SL. No.	PROBLEMS IDENTIFIED	CATE-GORY
8	FASTER WEAR OF BRAKE SHOE LININGS OF VARIOUS DRIVES.	A
9	DIFFICULTY FACED IN ROTARY PLATE DIVERTER WIPER ADJUSTMENTS	A
10	HIGH FREQUENCY OF CHANGING THE CRAWLER PADS.	B
11	INEFFECTIVE SIDE WIPERS IN SPECIALISED MINING EQUIPMENT.	A
12	HIGHER WEAR OF ROTARY PLATE & RING CHUTE WEAR PLATES.	A
13	HIGHER CONSUMPTION OF TEETH IN BUCKET WHEEL EXACAVATOR.	B
14	INEFFECTIVE RING CHUTE WIPERS.	A
15	FREQUENT FAILURE OF PRESSURE ROLLERS.	B
16	FREQUENT MISSING OF BUCKET WEDGES	A

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PROBLEM IDENTIFICATION

SL.No.	PROBLEMS IDENTIFIED	CATEGORY
17	FREQUENT MISSING OF BUCKETS PINS.	A
18	FAILURE OF BUCKET WEDGE LOCKING COLLAR.	A
19	MORE WEAR OF VARIOUS BRAKE DRUMS.	B
20	FAILURE OF CAM SLEEVES AND BOLTS IN TRACK DRIVES.	B
21	BRAKE FRAME PIN & BUSH FAILURE DUE TO SOIL.	B
22	DIFFICULTIES FACED IN ROTARY PLATE CIRCUMFERENTIAL WIPER ADJUSTMENT.	A
23	ROTARY PLATE CHUTE AREA TEFLON SHEET DAMAGE PROBLEM.	A
24	BUCKET CHAIN MAT LINKS WORN OUT PROBLEM	A
25	BUCKET BELT MAT GETTING DAMAGES.	A

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PROBLEM IDENTIFICATION

SL. No.	PROBLEMS IDENTIFIED	CATE-GORY
26	SHEARING OF TRACK PIN LOCK PLATES.	B
27	DAMAGE OF SPILLAGE GUARD AND SPILLAGE GUARD FIXING BOLTS.	A
28	FREQUENT FAILURE OF IMPACT ROLLER LINK PLATES AND BOLTS.	A
29	DISLOCATION OF “V” WIPER FRAME.	A
30	INEFFECTIVE ROTARY PLATE DIVERTER WIPERS.	A
31	FASTER WEAR OF LAGGING IN SNUB PULLEY.	A
32	FREQUENT DAMAGES OF BUCKET WHEEL GEAR BOX WALKWAY.	B
33	MISSING OF BUCKET TEETH & TEETH BOLTS.	A
34	SHEARING OF TRACK PIN & LINKS.	B

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PROBLEM IDENTIFICATION

SL.No.	PROBLEMS IDENTIFIED	CATE-GORY
35	DAMAGE OF BUCKETS DUE TO STONE HIT.	B
36	CHAIN CUT IN VARIOUS DRIVES IN CABLE DRUM.	B
37	WEAR OUT OF ROLLERS IN CABLE HANDLING SYSTEM.	A
38	WEARING OUT OF CHUTE BELT/HOPPER BELT.	A
39	LINE OUT OF PROBLEM IN BELT DRIVE.	B
40	RUSTING & JAMMING OF TRACK TENSION SPINDLE	A
41	INEFFECTIVE V WIPERS	A
42	FREQUENT FAILURE OF CARRYING ROLLERS	A
43	FREQUENT FAILURE OF RETURN ROLLERS	A
44	FREQUENT FAILURE OF BOBBIN BOLTS IN C.D CHAIN	B

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PROBLEM IDENTIFICATION

SL.No.	PROBLEMS IDENTIFIED	CATE-GORY
45	PROBLEMATIC DISLOCATION OF CABLE GUIDE	B
46	PROBLEMS FACED IN CABLE WINDING AND UNWINDING	B
47	PROBLEMATIC TRACK TENSIONING AND DETENSIONING WORKS IN SME	A
48	PROBLEMS FACED IN CARRING ROLLER BOLTS MISSING	A
49	PROBLEMS FACED IN TRACK HALF PAD DAMAGE	A
50	PROBLEMS FACED IN TRACK TENSIONING SPINDLE BEND	A
51	FREQUENT SHELL CUT IN D.B SNUP PULLEYS	B
52	PROBLEMS FACED IN TRACK PLATE WORN OUT AT MIDDLE	A

A - WHICH CAN BE SOLVED BY OUR TEAM ITSELF.

B - OTHER DEPARTMENTS INVOLVED.

C - MANAGEMENT INVOLVED.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

DATA COLLECTION

(STOPPAGES IN SME FROM MAINTENANCE LOG BOOK)

PERIOD : FROM 01.01.2018 TO 31.03.2018

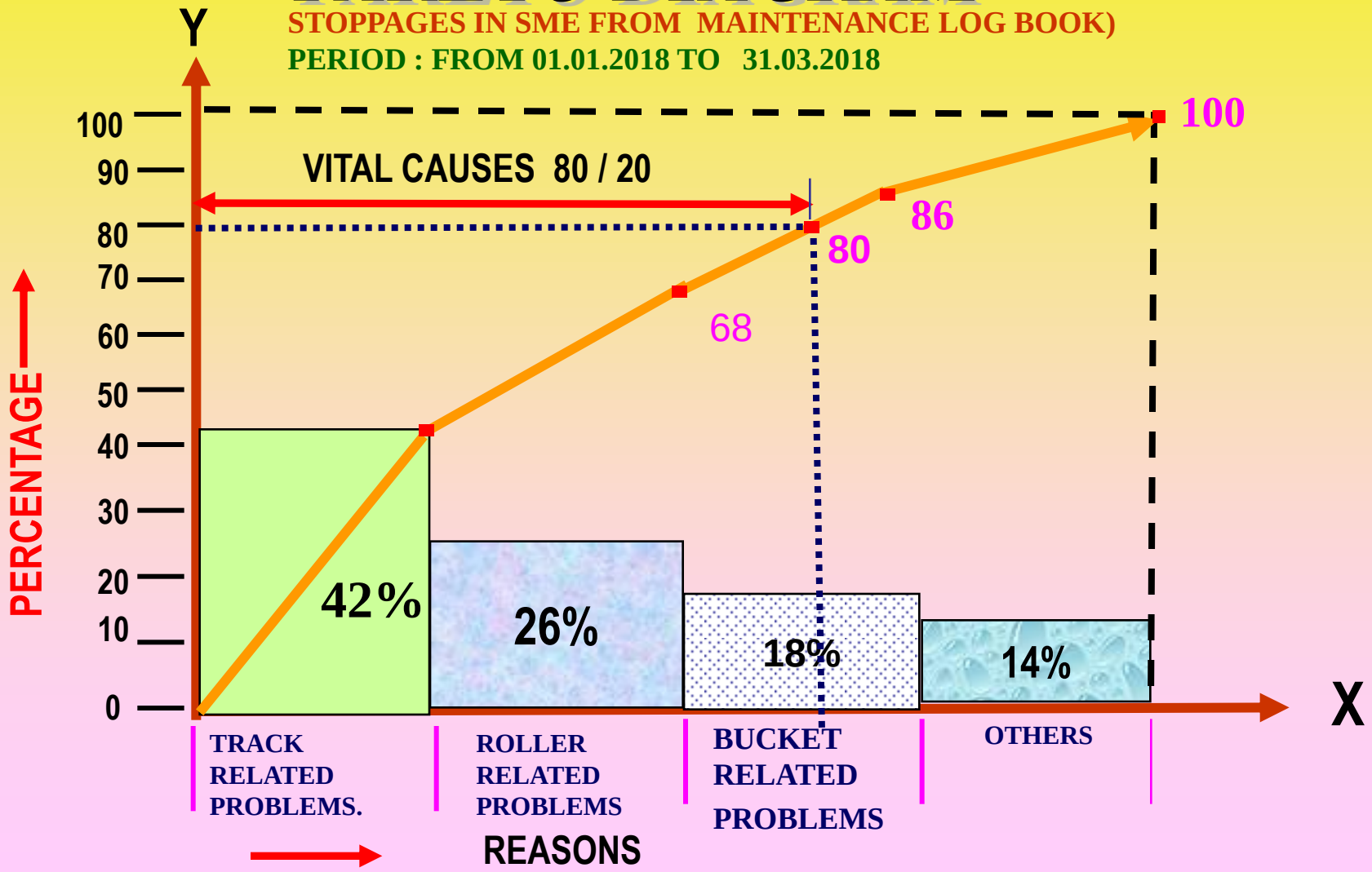
SL. NO	STOPPAGES	NUMBER OF OCCURANCE	PERCENTAGE	CUMULATIVE %
1	TRACK RELATED PROBLEMS.	21	42%	42%
2	ROLLER RELATED PROBLEMS.	13	26%	68%
3	BUCKET RELATED PROBLEMS.	9	18%	86%
4	OTHERS	7	14%	100%

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PARETO DIAGRAM

STOPPAGES IN SME FROM MAINTENANCE LOG BOOK)

PERIOD : FROM 01.01.2018 TO 31.03.2018



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STEP 2

SELECTION OF PROBLEM

- 25 - PROBLEMS OF ‘A’ CATEGORY NEEDED IMMEDIATE ATTENTION OF A, B, C CATEGORIES.
- ALL MEMBERS RANKED THE PROBLEM ON THE BASIS OF QUALITY, COST, SAFETY, DELIVERY AND SERVICE BY ALLOTING 20 MARKS FOR EACH BASE.
- BY CONSOLIDATING, AVERAGE MARKS WERE TABULATED.
- SEVEN MAJOR PROBLEMS BASED ON ITS SEVERITY WAS CONSIDERED.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PROBLEM PRIORITISATION

- PROBLEMATIC TRACK TENSIONING / DE TENSIONING WORKS IN SME.
- MISSING OF BUCKET TEETH AND TEETH BOLTS .
- FREQUENT FAILURE OF IMPACT ROLLER LINK PLATES AND BOLTS.
- FREQUENT MISSING OF BUCKET WEDGES.
- PROBLEMS FACED IN TRACK TENSIONING SPINDLE BEND .
- INEFFECTIVE RING CHUTE WIPERS.

OF THE ABOVE SEVEN PROBLEMS FOLLOWING THREE PROBLEMS ON ITS FREQUENT RECCURRENCE WERE ZEROED IN.

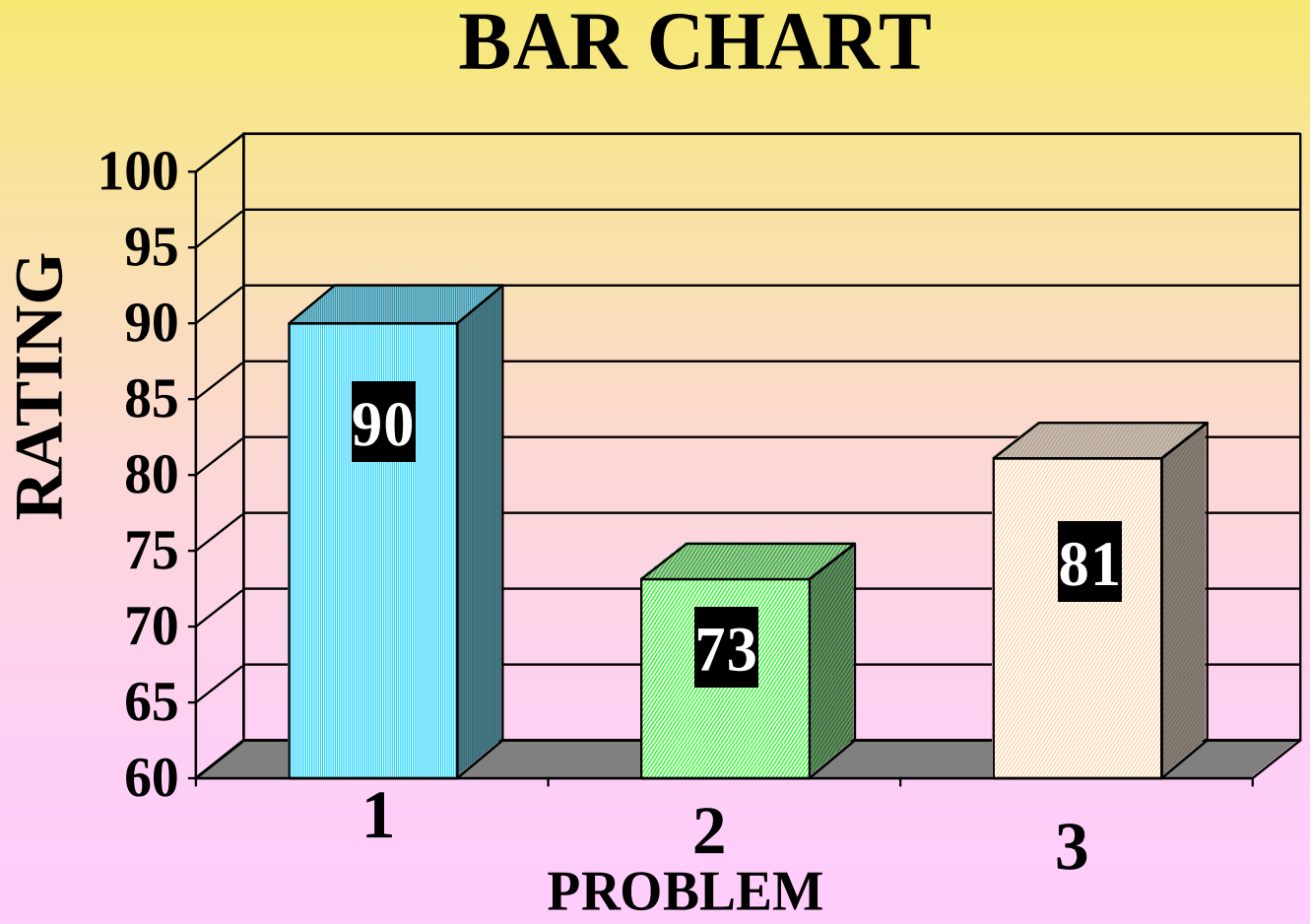
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PROBLEM SELECTION BY RANKING

SL. No.	BASE PROBLEM	WEIGHTAGE (AVERAGE MARKS)						
		QUALITY (20)	COST (20)	SAFETY (20)	DELIVERY (20)	SERVICE (20)	TOTAL (100)	RANK
1	PROBLEMATIC TRACK RENSIONING / DE TENSIONING WORKS IN SME	19	18	16	18	19	90	I
2	MISSING OF BUCKET TEETH AND TEETH BOLTS .	16	14	13	15	15	73	III
3	FREQUENT FAILURE OF IMPACT ROLLER LINK PLATES AND BOLTS.	15	17	16	15	18	81	II

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

THREE PROBLEMS SELECTED BY RATING



1	PROBLEMATIC TRACK RENSIONING / DE TENSIONING WORKS IN SME
2	MISSING OF BUCKET TEETH AND TEETH BOLTS .
3	FREQUENT FAILURE OF IMPACT ROLLER LINK PLATES AND BOLTS.

TOPIC

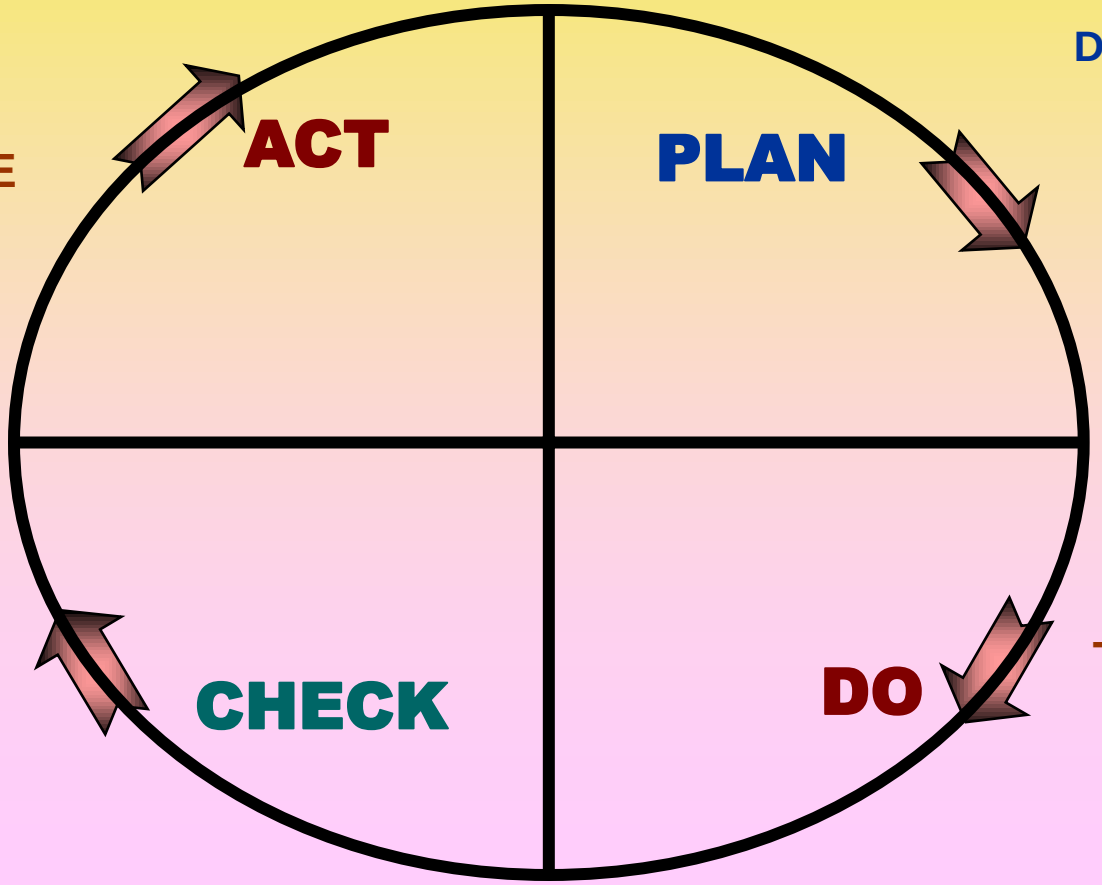
MODIFICATION PROCESS OF TRACK TENSIONING IN SPECIALISED MINING EQUIPMENT

NLC INDIA LIMITED. NEYVELI. TAMILNADU.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

DEMING CIRCLE

WE FOLLOWED THE DEMING'S CIRCLE CONCEPT TO SOLVE OUR PROBLEM.



TAKE CORRECTIVE ACTION AND IMPLEMENT

DECIDE ON THE OBJECTIVE

DECIDE THE METHOD OF ACHIEVING

CHECK THE RESULT

TRAIN AND EDUCATE

DO THE WORK

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

ACTIVITY PLANNING CHART

QC NAME CHALLENGE	DEPT - SME/MM	REASON FOR SELECTION: MORE DOWN TIME	**MEMBER'S NAME:** K. BALAMURUGAN S. TAMILVANAN L. RAJAGOPAL G. RAJASEKAR D. SUNDARARAJAN R. SOWNDARARAJAN
PROJECT : TRACK TENSIONING JIG / FIXTURE		DATE OF BEGINNING : 27.03.2018 DATE OF COMPLETION : 19.04.2018	
PROJECT NO : 81 T-Target , A - Actual		MEETING DAY : THURSDAY TIME : 12.40 TO 13.20 hrs	

SL. NO	ACTIVITY. DAYS →	2	4	6	8	10	12	14	16	18	20	22	24	T	A
1	DEFINING THE PROBLEM	→												2	
2	ANALYZING THE PROBLEM		→											2	
3	IDENTIFYING CAUSES			→	→									4	
4	FINDING ROOT CAUSE					→								2	
5	DATA ANALYSIS						→							2	
6	DEVELOPING SOLUTION							→	→					4	
7	FORESEEING RESISTANCE									→				2	
8	TRIAL IMPLEMENTATION										→			2	
9	REGULAR IMPLEMENTATION											→		2	
10	FOLLOW UP / REVIEW												→	2	

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 3

DEFINITION OF THE PROBLEM

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MODIFICATION PROCESS OF TRACK TENSIONING IN SME

CRUX OF THE PROBLEM

DUE TO CONTINOUS WORKING OF SME MACHINES THE TRACK PLATES, PINS, CAMS REQUIRED REPLACEMENT PERIODICALLY. FOR THIS WORKS TRACK TENSIONING / DE TENSIONING IS REQUIRED.

↓

FOR THE TRACK TENSIONING WORKS HANDLING AND POSITIONING OF HYDRAULIC JACK IS NECESSARY

↓

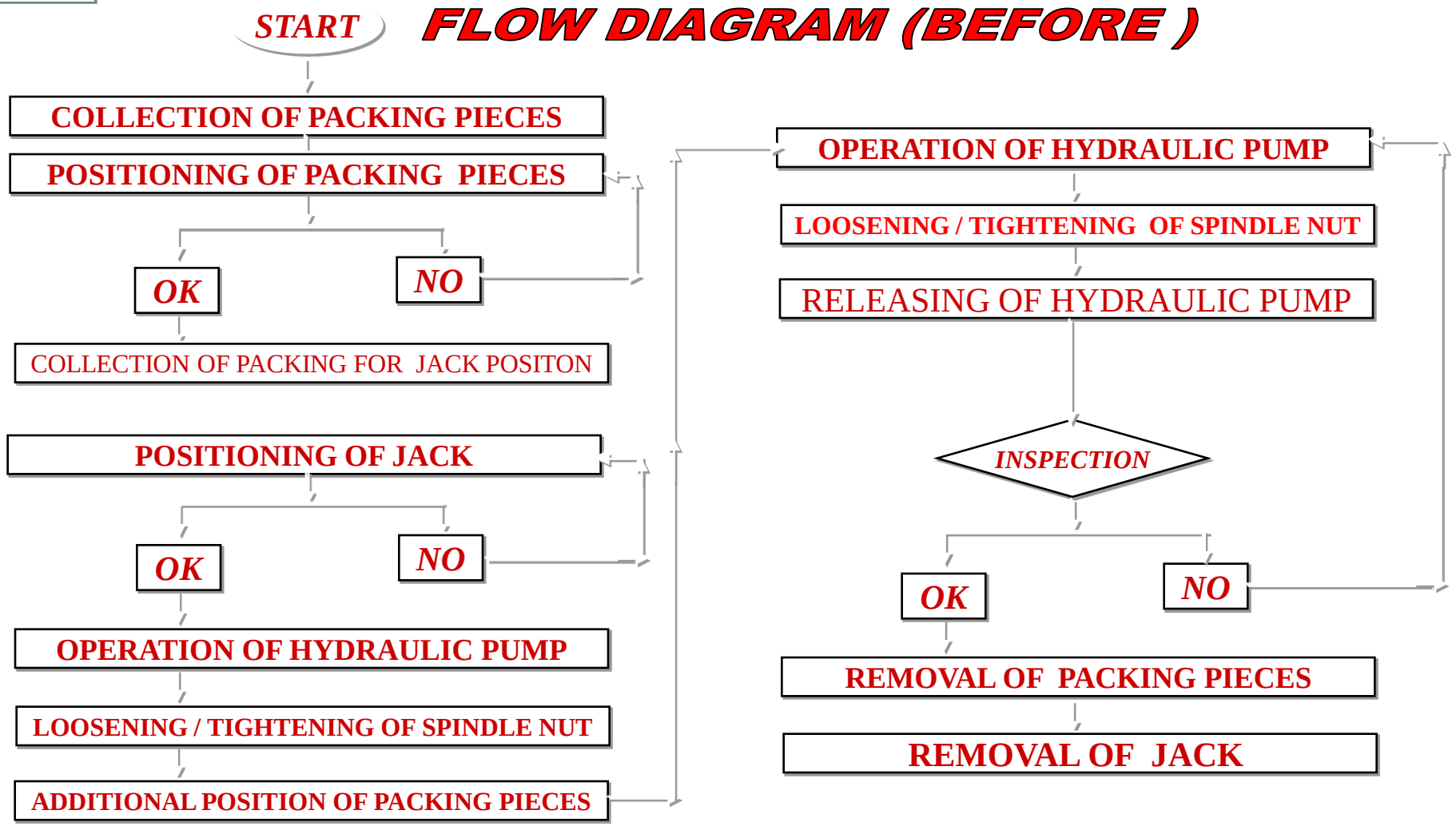
THERE IS NO PROPER ARRANGEMENT FOR HANDLING AND POSITONING OF HYDRAULIC JACK

↓

TENSIONING / DE TENSIONING OF TRACK LEADS TO INCREASING DOWN TIME OF SME.

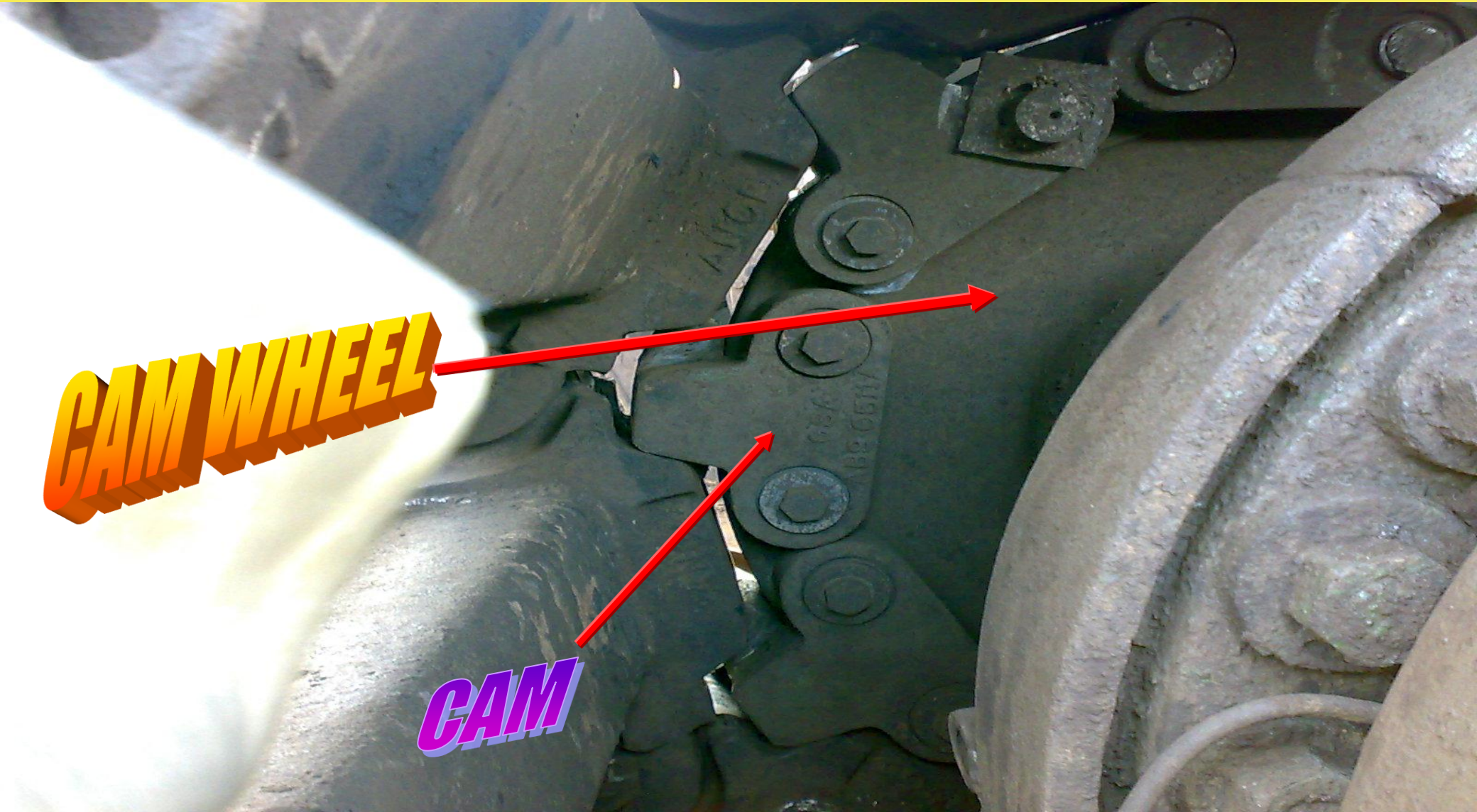
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

FLOW DIAGRAM (BEFORE)



MODIFICATION PROCESS OF TRACK TENSIONING IN SME

LOCATION OF CAM WHEEL



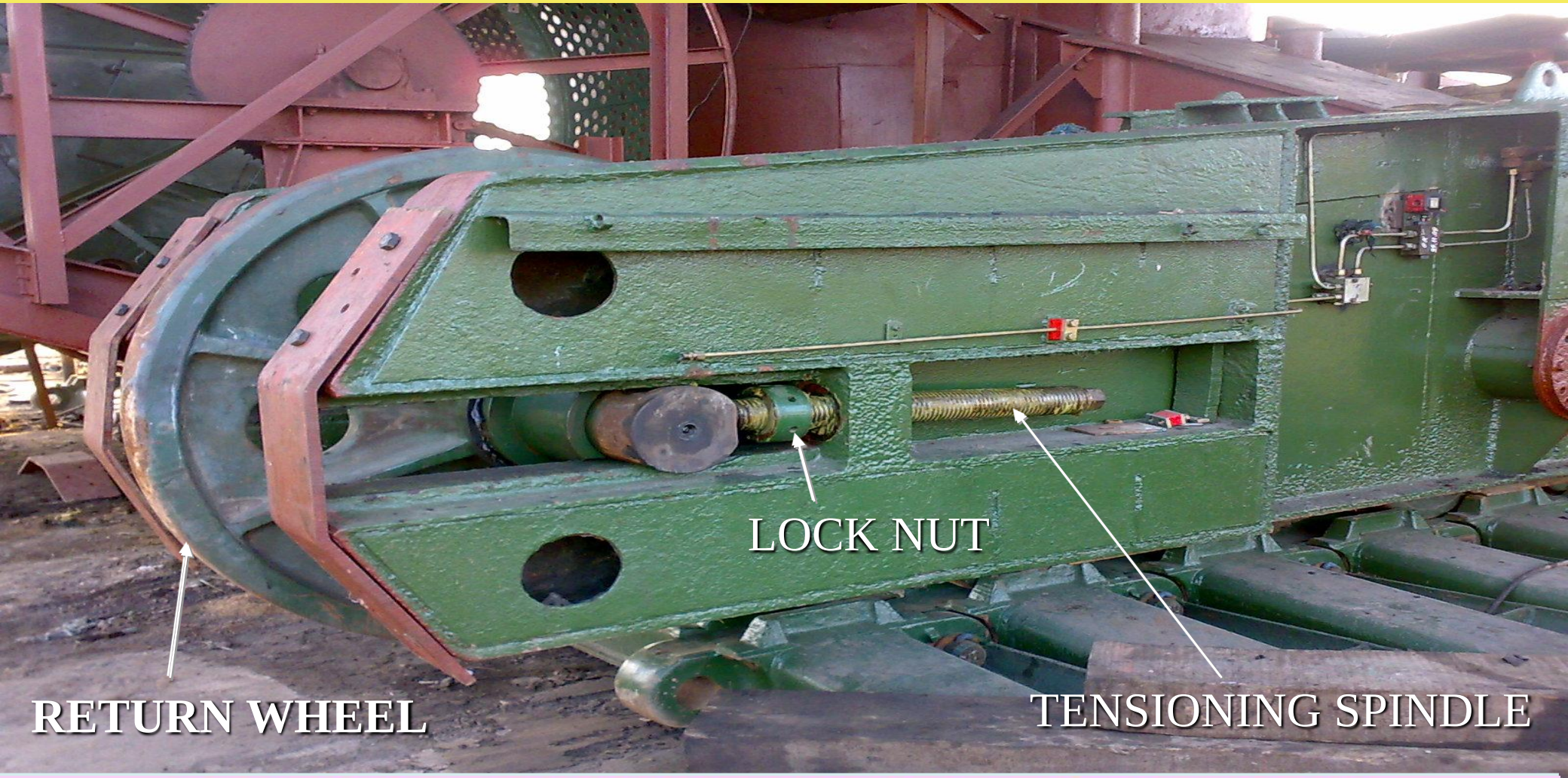
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

CAM WHEEL WITH GEAR BOX

NLC INDIA LIMITED. NEYVELI. TAMILNADU.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

RETURN WHEEL ASSEMBLY IN TRACK



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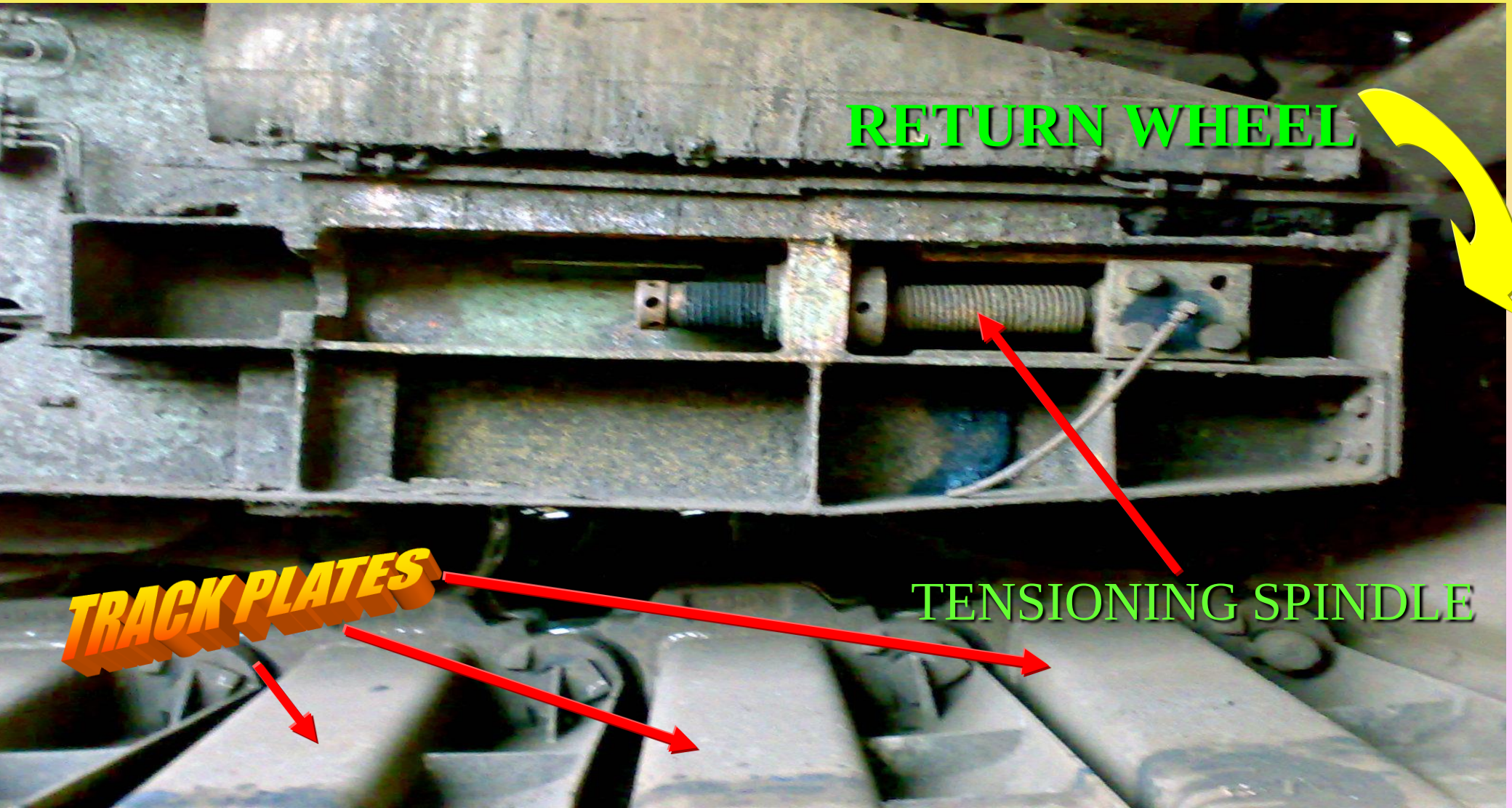
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

LOCATION OF TENSIONING SPINDLE

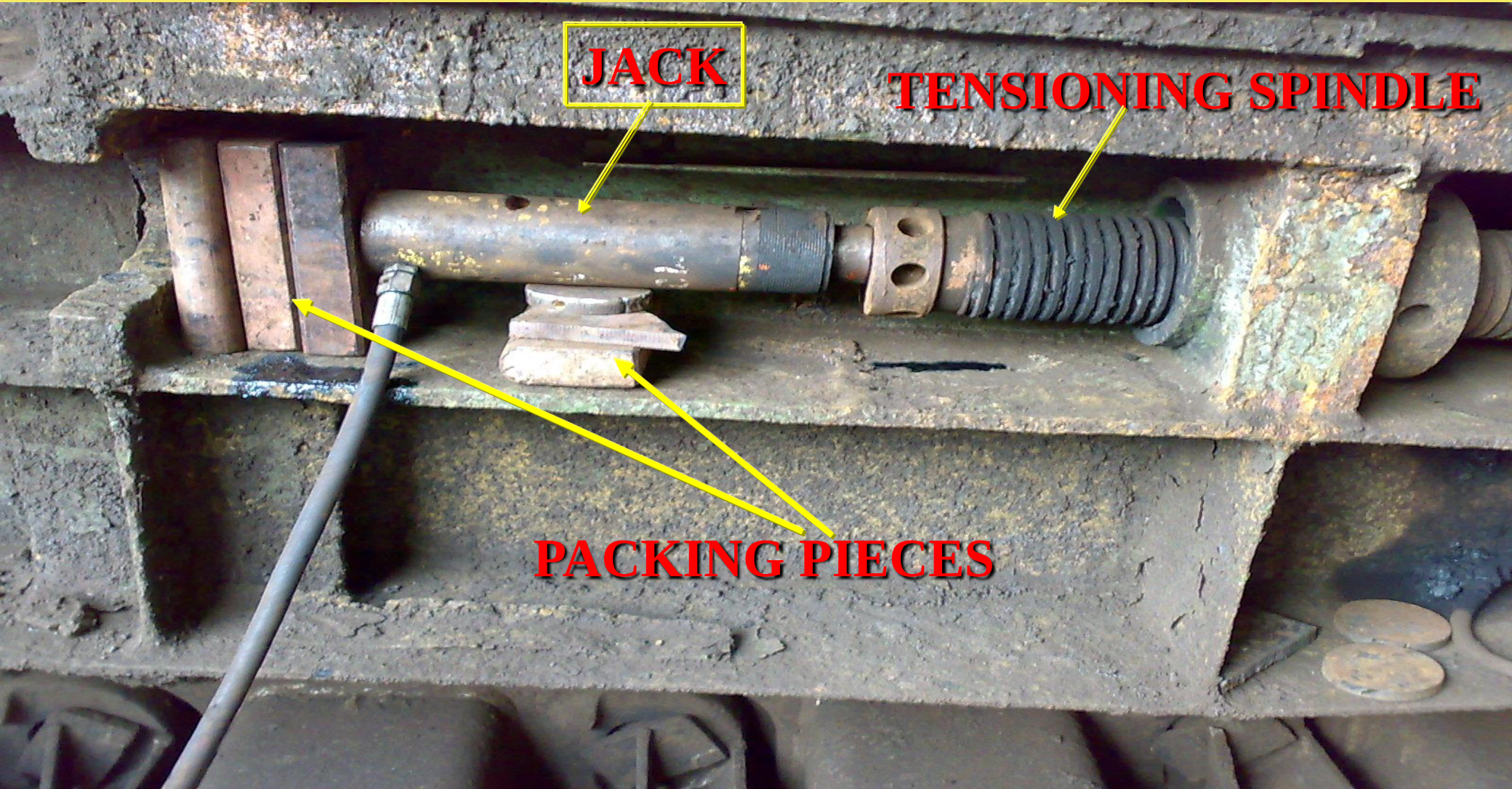


MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PACKING PIECES

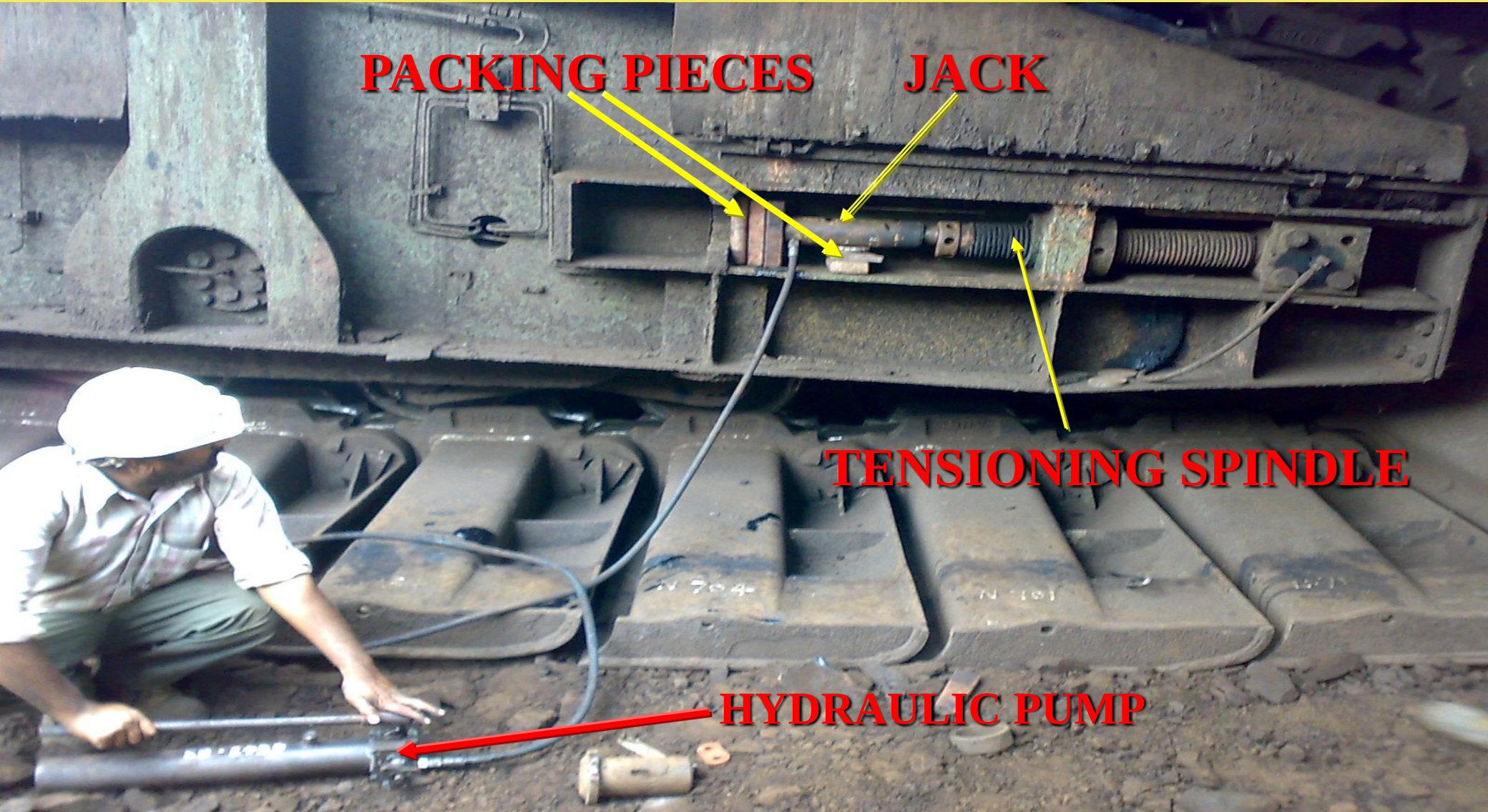
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

TRACK TENSIONING OLD METHOD



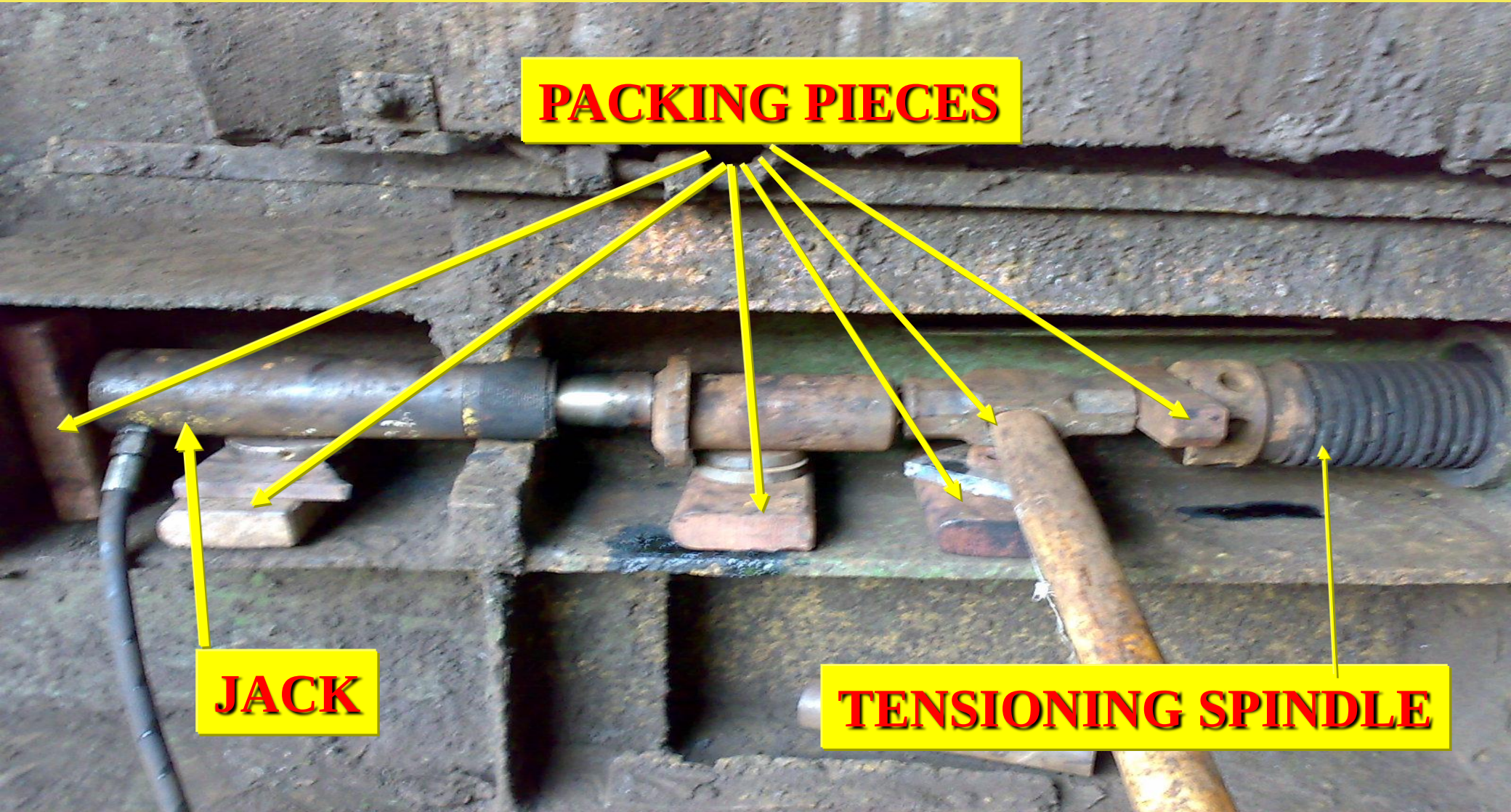
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

TRACK TENSIONING OLD METHOD



MODIFICATION PROCESS OF TRACK TENSIONING IN SME

TRACK TENSIONING OLD METHOD



MODIFICATION PROCESS OF TRACK TENSIONING IN SME

3MU ANALYSIS

SL. No.	FACTORS	MUDA WASTE	MURI STRAIN	MURA DISCREPANCY	AIM/ GOALS
1	MAN POWER	✓	✓	✓	WORK SIMPLIFICATION
2	METHOD	-----	-----	✓	
3	MATERIAL	✓	-----	✓	COST REDUCTION
4	TIME	✓	-----	✓	
5	PRODUCTION	✓	-----	✓	
6	RELATIONSHIP	-----	✓	✓	CUSTOMER SATISFACTION
7	SAFETY	-----	-----	✓	TO IMPROVE SAFETY

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 4
ANALYSING THE PROBLEM

4W &IH ANALYSIS

WHAT? IS OUR PROBLEM	POSITIONING OF PACKING PIECES AND JACK IN RIGHT POSITION
WHERE? DOES IT OCCUR	IN THE TRACK TENSIONING SPINDLE
WHEN? DOES IT ARISE	WHILE TRACK TENSIONING WORKS
WHICH? OPERATION	PRESSING OF TENSIONING SPINDLE
HOW? TO SOLVE THE PROBLEM	BY DESIGNING SPECIAL JIG AND FIXTURE TO POSITION THE JACK FOR TRACK TENSION

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 5

DATA COLLECTION

TIME STUDY

REASONS FOR DELAY IN TRACK TENSIONING WORKS .

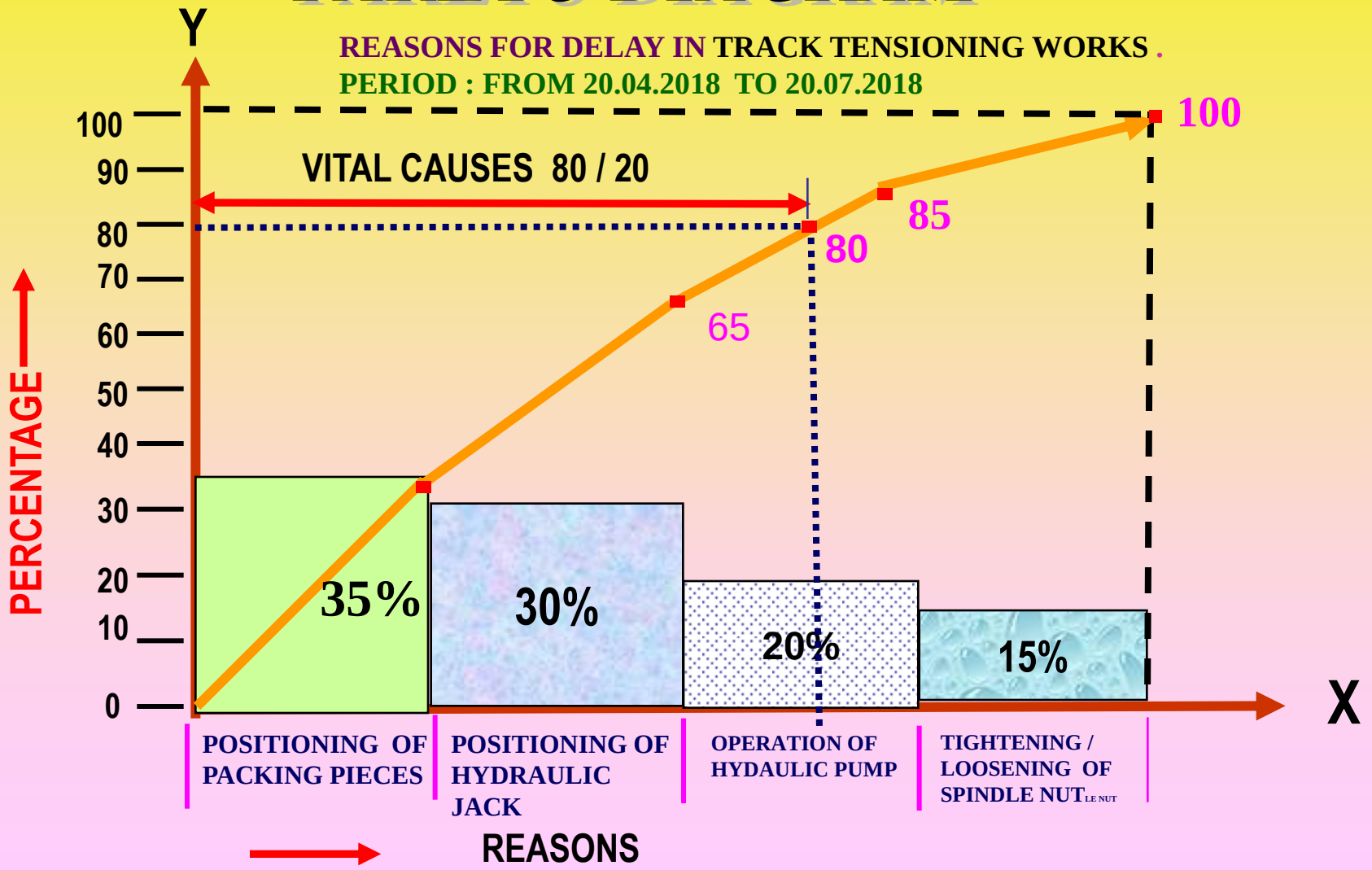
(SOURCE OF INFORMATION – MAINTENANCE LOG BOOK)

PERIOD : FROM 20.04.2018 TO 20.07.2018

SL. NO	EVENTS	TIME TAKEN (MIN.)	PERCENTAGE	CUMULATIVE %
1	POSITIONING OF PACKING PIECES	21	35%	35%
2	POSITIONING OF HYDRAULIC JACK	18	30%	65%
3	OPERATION OF HYDAULIC PUMP	12	20%	85%
4	TIGHTENING / LOOSENING OF SPINDLE NUT	9	15%	100%

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PARETO DIAGRAM



MODIFICATION PROCESS OF TRACK TENSIONING IN SME

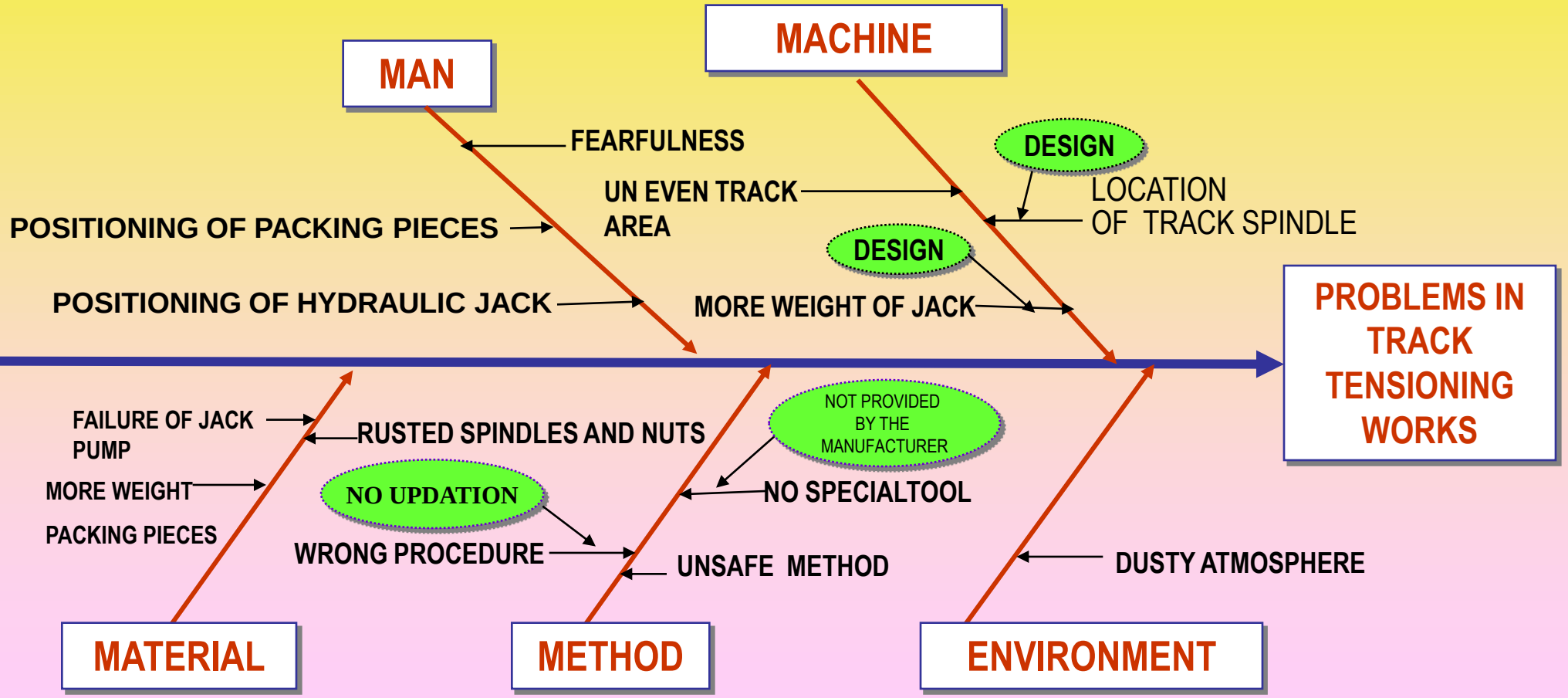
BRAIN STORMING

(CAUSES FOR DELAY IN TRACK TENSIONING WORKS)

- WRONG PROCEDURE
- NO SPECIAL TOOL
- DUSTY ATMOSPHERE
- POSITIONING OF PACKING PIECES
- POSITIONING OF HYDRAULIC JACK
- RUSTED SPINDLES AND NUTS
- LOCATION OF TRACK SPINDLE
- UN EVEN TRACK AREA
- FEARFULNESS
- MORE WEIGHT OF PACKING PIECES
- UNSAFE METHOD
- MORE WEIGHT OF JACK
- FAILURE OF JACK PUMPS

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

CAUSE & EFFECT DIAGRAM

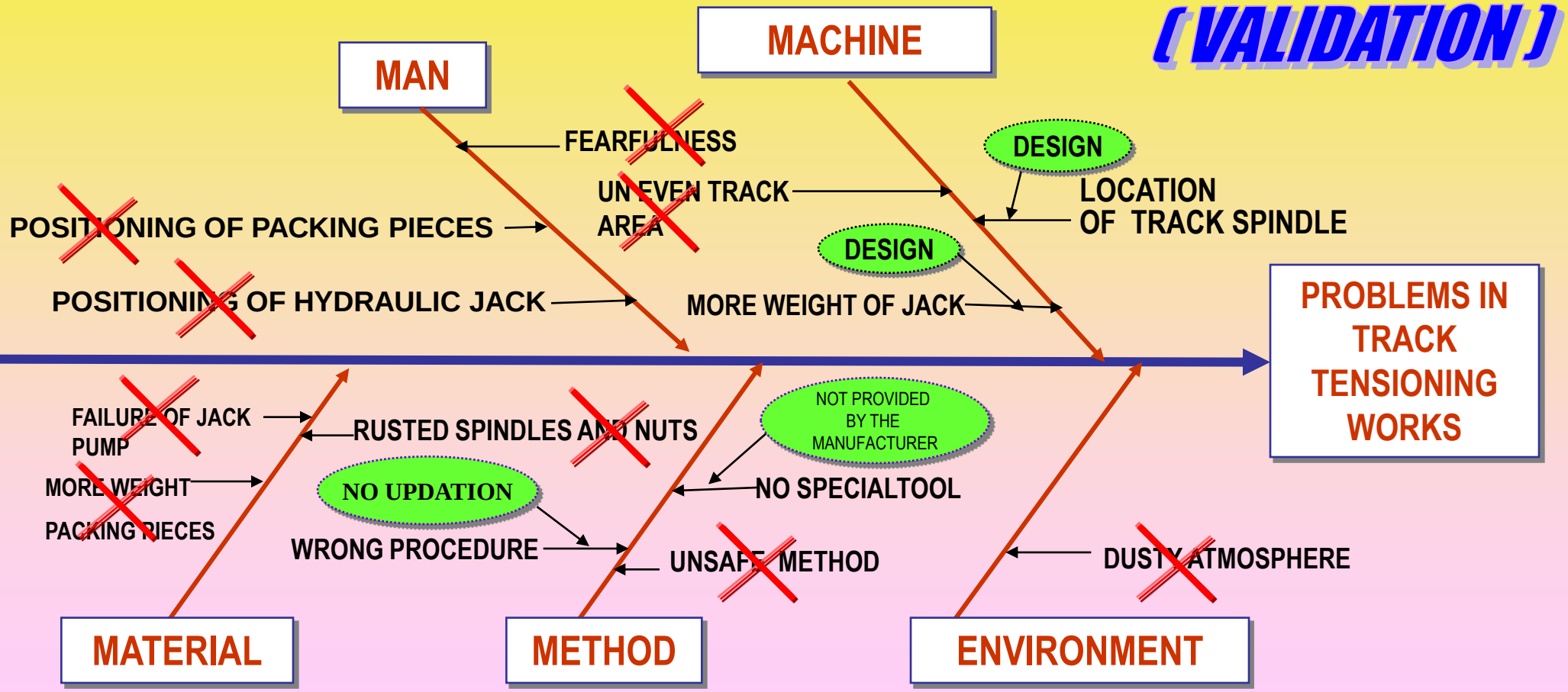


MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 6

CAUSE & EFFECT DIAGRAM

(VALIDATION)



ROOT CAUSES

- LOCATION OF TRACK SPINDLE
- MORE WEIGHT OF JACK
- NO SPECIAL TOOL
- WRONG PROCEDURE

ROOT CAUSE ANALYSIS

WHY ? WHY ? ANALYSIS

CAUSE	ROOT CAUSE
WHY LOCATION OF TRACK SPINDLE ?	DESIGN
WHY MORE WEIGHT OF JACK?	DESIGN
WHY WRONG PROCEDURE?	NO UPDATION
WHY NO SPECIAL TOOL?	NOT PROVIDED BY THE MANUFACTURER

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 7
DATA ANALYSIS

DATA COLLECTION

TIME STUDY

REASONS FOR DELAY IN TRACK TENSIONING WORKS .

(SOURCE OF INFORMATION – MAINTENANCE LOG BOOK)

PERIOD FROM 01.01.2018 TO 31.03.2018

SL. NO	EVENTS	TIME TAKEN (MIN.)	PERCENTAGE	CUMULATIVE %
1	POSITIONING OF PACKING PIECES	21	35%	35%
2	POSITIONING OF HYDRAULIC JACK	18	30%	65%
3	OPERATION OF HYDAULIC PUMP	12	20%	85%
4	TIGHTENING / LOOSENING OF SPINDLE NUT	9	15%	100%

MORE TIME TAKEN IN FIRST TWO EVENTS

SL NO	EVENTS	TIME TAKEN (MIN.)	PERCENTAGE	CUMULATIVE %
1	POSITIONING OF PACKING PIECES	21	35%	35%
2	POSITIONING OF HYDRAULIC JACK	18	30%	65%

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 8

BRAIN STORMING

FOR RECOMMENDATIONS

1	REPLACE THE FULL SET OF TRACK PLATES
2	MAINTAIN THE TRACK MOVEMENT AREA IN LEVEL
3	CLEAN THE TENSIONING SPINDLE AND NUT REGULARLY
4	FABRICATION OF SPECIAL JIG AND FIXTURE FOR JACK PUMP POSITIONING.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 9

ECT OPTION CHART

SL. No.	RECOMMENDATIONS	EFFECTIVENESS	COST.	TIME	PRIORITY
1	MAINTAIN THE TRACK MOVEMENT AREA IN LEVEL	EFFECTIVE	MORE	MORE	III
2	FABRICATION OF SPECIAL JIG AND FIXTURE FOR JACK PUMP POSITIONING.	VERY EFFECTIVE	LESS	LESS	I
3	CLEAN THE TENSIONING SPINDLE AND NUT REGULARLY	EFFECTIVE	MORE	LESS	II
4	REPLACE THE FULL SET OF TRACK PLATES	EFFECTIVE	MORE	MORE	IV

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 10

TRIAL IMPLEMENTATION AND CHECK PERFORMANCE

ACTION PLAN

SL. NO	ACTIVITY	RESPONSIBILITY	TARGET CLOSE	RESULT	REMARKS
1	PREPARE SKETCH	S. TAMILVANAN	12.04.2018	COMPLETED	--------
2	DISCUSS WITH HOD	K. BALAMURUGAN	15.04.2018	APPROVED	--------
3	COLLECT MATERIAL & PREPARE MODEL	L. RAJAGOPAL G.RAJASEKAR	16.04.2018	COMPLETED	SCRAP MATERIAL USED
4	COLLECT MATERIAL & FABRICATING	D. SUNDARARAJAN R. SOWNDARARAJAN	18.04.2018	COMPLETED	SCRAP MATERIAL USED
5	COLLECT DOCUMENT & GOT APPROVAL	S. TAMILVANAN K. BALAMURUGAN	24.04.2018	COMPLETED	-------

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

TRIAL IMPLEMENTATION

ACT

RESULTS WERE SATISFACTORY WE DECIDED TO IMPLEMENT THIS NEW METHOD

PLAN

WE PLANNED TO FABRICATE NEW JIGAND FIXTURE FOR TRACK TENSIONING WORKS.

DO

MATERIALS COLLECTED FOR JIG, FIXTURE AND FABRICATED AS PER DESIGN

CHECK

TENSIONING THE TRACK WITH THIS JIG AND FIXTURE IN 1572 BWE AND MTC II

A P C D

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PERFORMANCE CHECK

1. INITIALLY, ONE TELESCOPIC TYPE PIPES WERE USED FOR THE JIG FOR THE TENSIONING PROCESS.

2. HOLES ARE PROVIDED IN THE TELESCOPIC PIPES AT VARIOUS DISTANCES. BOLTS ARE PROVIDED FOR CONNECTING THE TELESCOPIC PIPES FOR ADJUSTING THE DISTANCE BETWEEN THE HYDRAULIC JACK AND SPINDLE.

3. BUT ON USAGE , THE CONNECTIOG BOLTS OF THE TELESCOPIC PIPES GOT SHEARED DUE TO TENSIONING FORCE.

4. FURTHER MODIFICATION WAS REQUIRED ON THE JIG TO WITHSTAND THE LOAD.

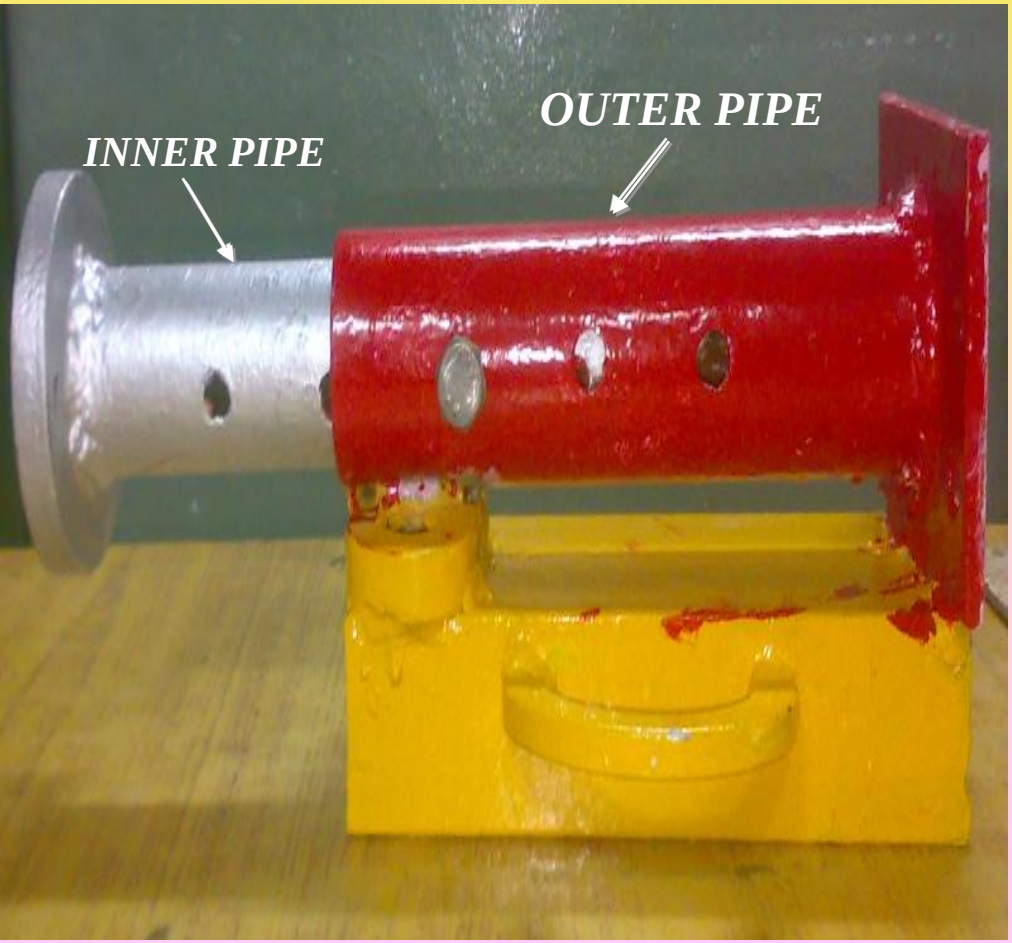
5. SPECIAL JIG WAS DESIGNED WITH THREADED ARRANGEMENT FOR THE REQUIRED LENGTH.

6. PERFORMANCE OF THE NEW JIG HAS BEEN OBSORBED AND FOUND GOOD.

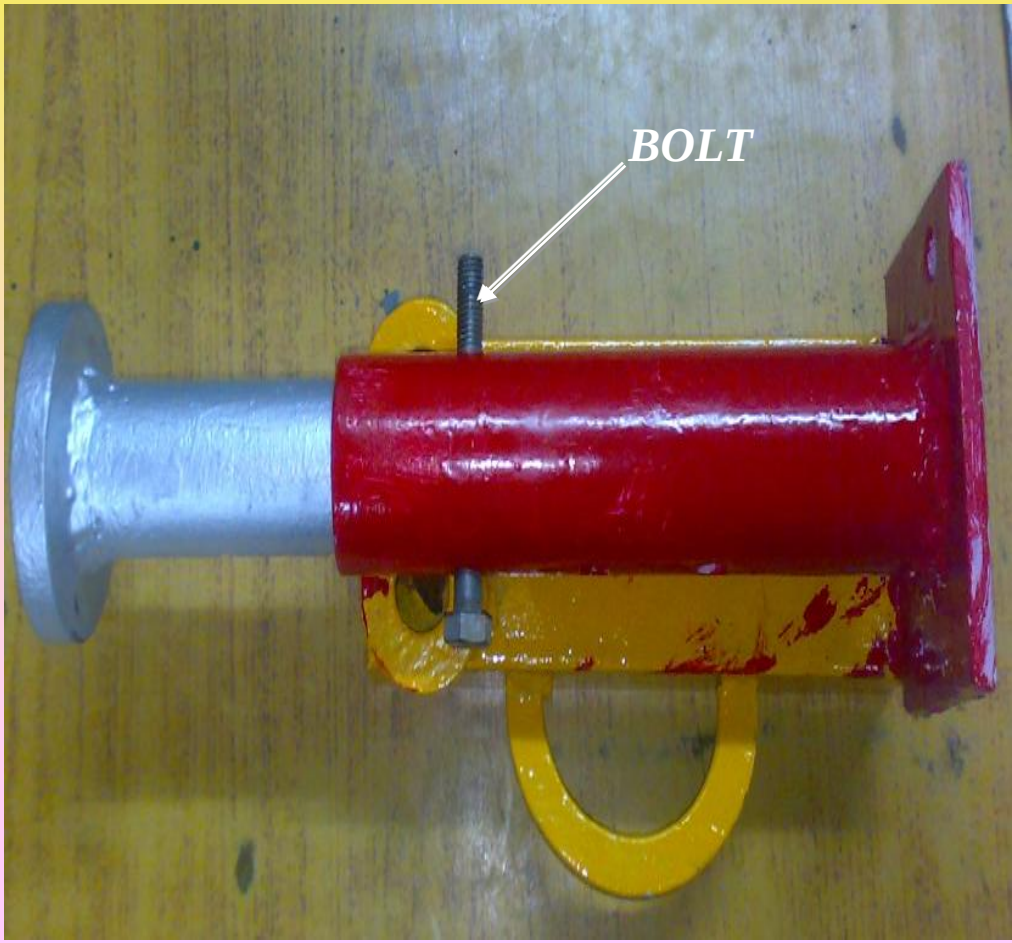
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

TELESCOPIC TYPE JIG

FRONT VIEW



TOP VIEW



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MODIFICATION PROCESS OF TRACK TENSIONING IN SME

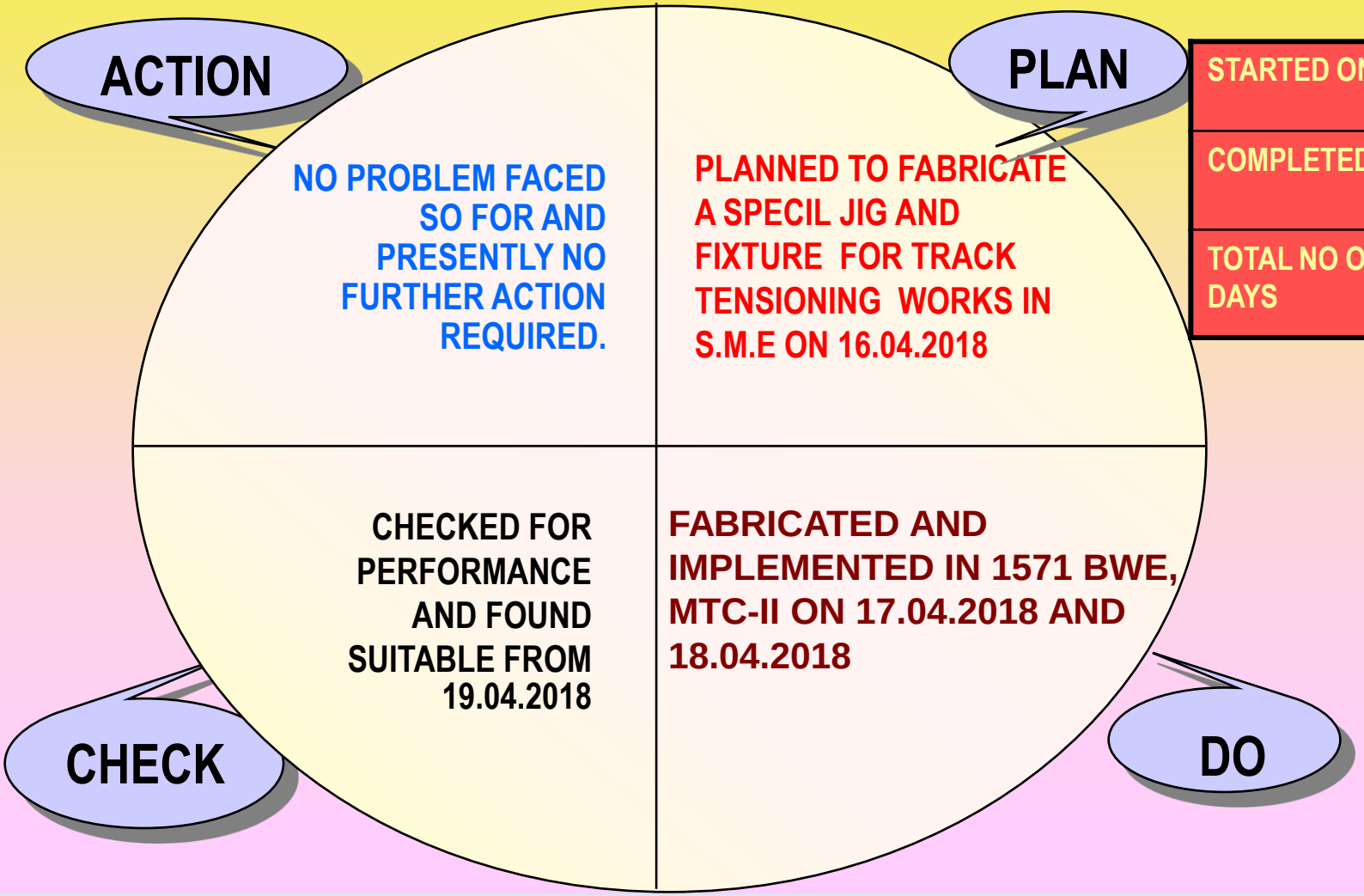
TRAIL IMPLEMENTATION

- ONE FIXTURE OF FLAT BED WAS PREPARED FOR POSITIONING THE HYDRAULIC JACK.
- DIFFICULTIES FACED DURING ALIGNMENT WITH TENSION SPINDLE.
- IT WAS DECIDED TO IMPROVE THE DESIGN OF THE FIXTURE.
- V- SHAPED BRACKET WAS DEVELOPED FOR THE POSITIONING OF HYDRAULIC JACK.
- NOW THE ALIGNMENT OF THE HYDRAULIC JACK, TENSION SPINDLE AND THE JIG IS IN LINE.
- THE SPECIAL JIG AND FIXTURE IS FABRICATED AND IMPLEMENTED SUCCESSFULLY AT 1571 BWE , MTC-II ON 18.04.2018.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PDCA CHART

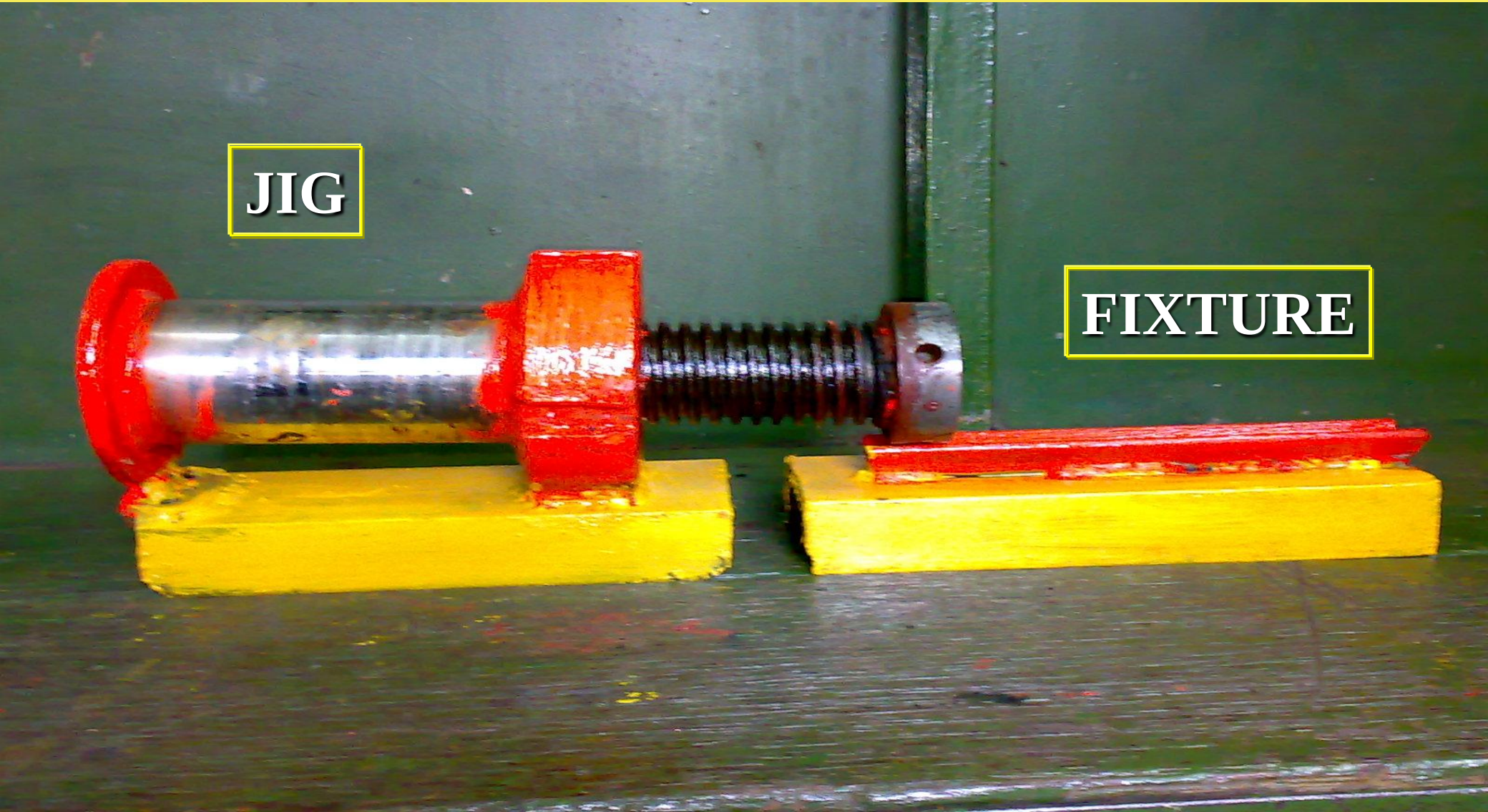
(FOR THE FABRICATION OF SPECIAL JIG AND FIXTURE)



STARTED ON	16.04.2018
COMPLETED ON	18.04.2018
TOTAL NO OF DAYS	3-DAYS

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

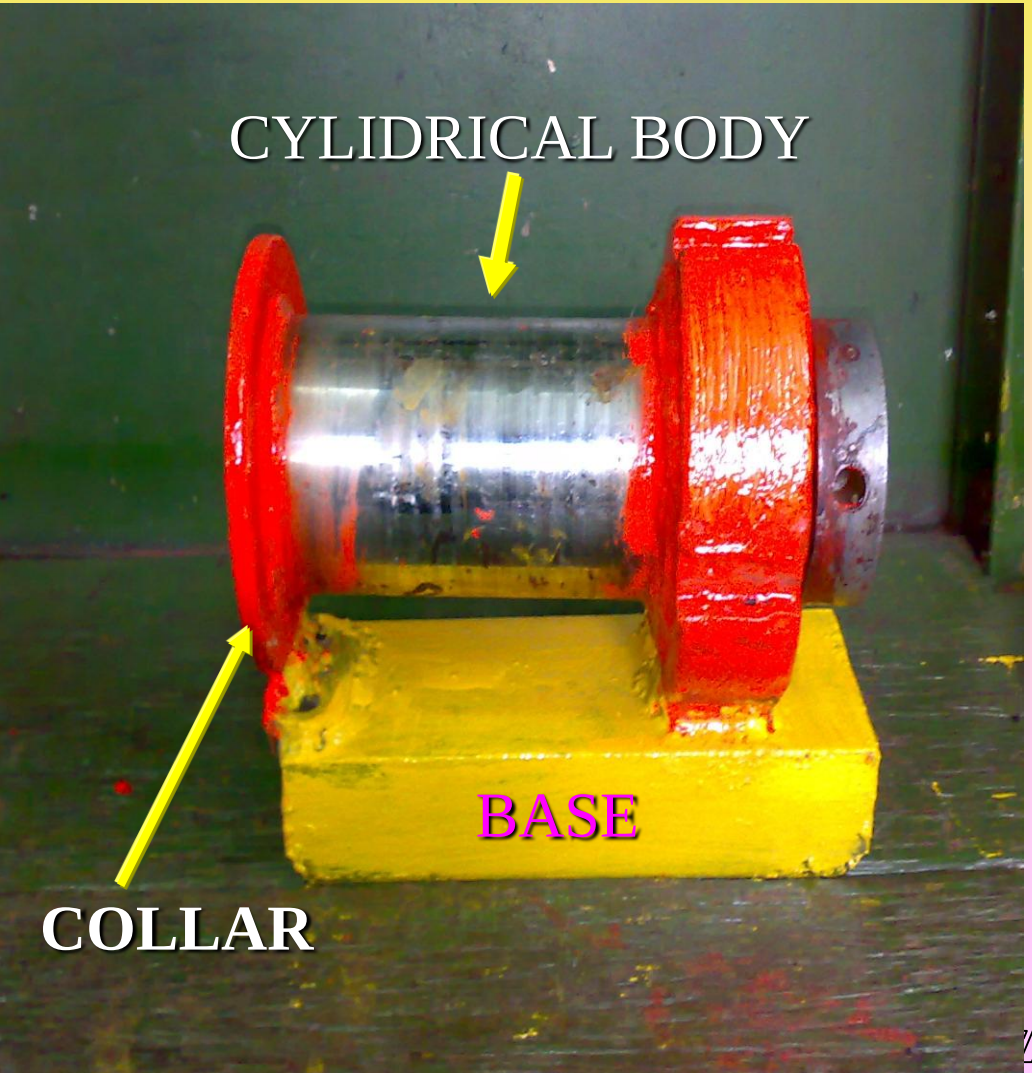
JIG WITH FIXTURE



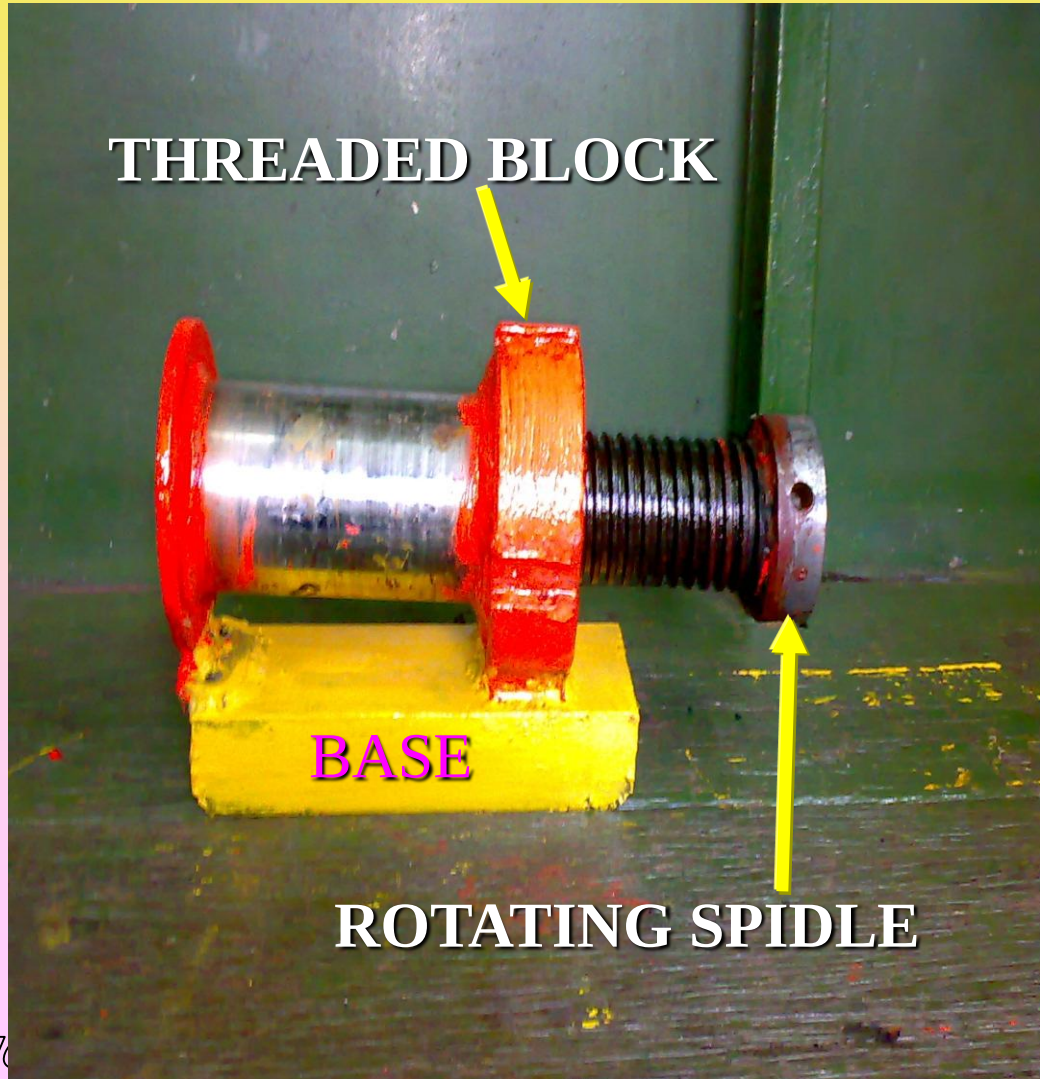
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

JIG

NORMAL

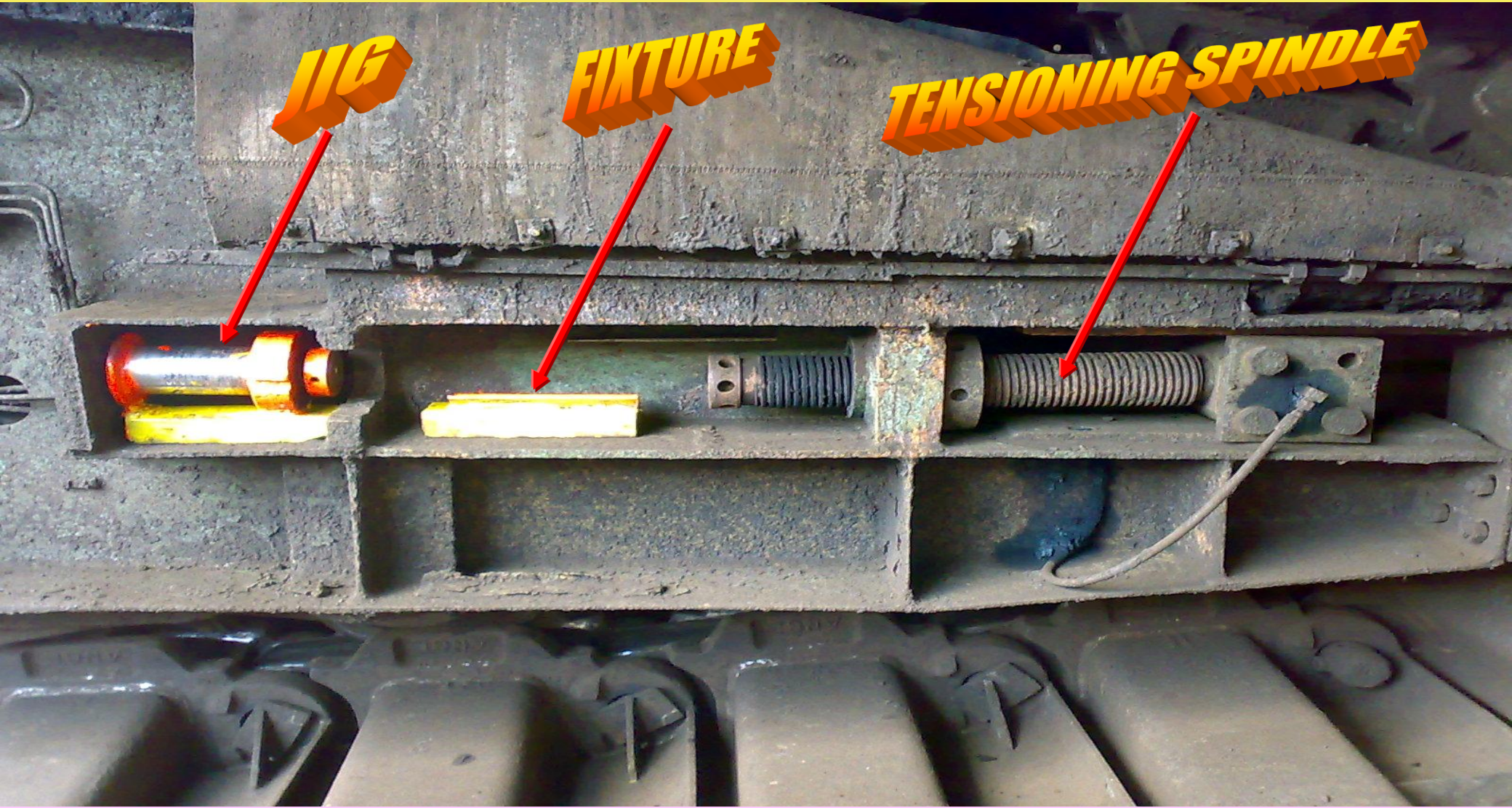


EXTENDED POSITION



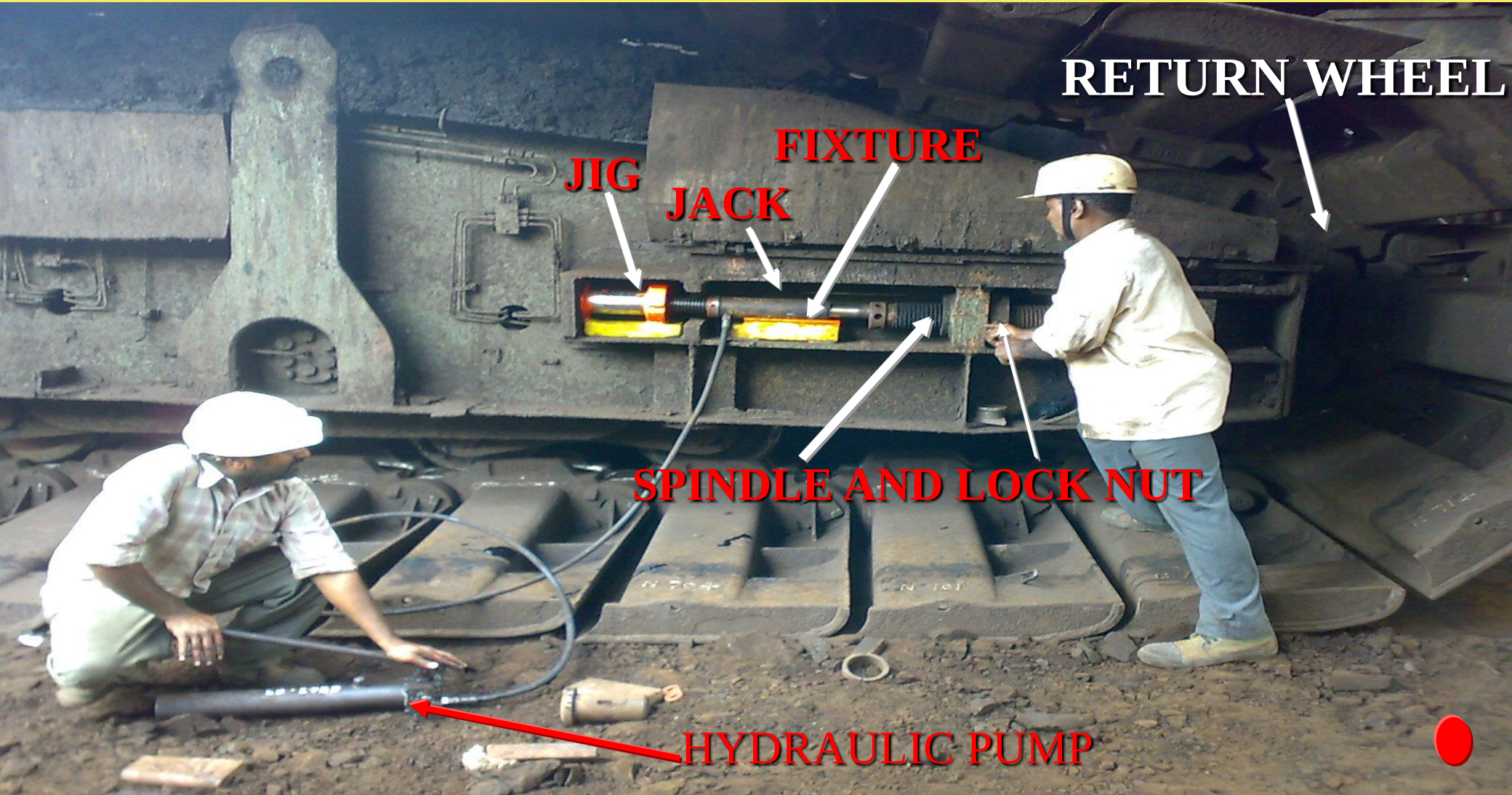
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

JIG AND FIXTURE IN POSITION



MODIFICATION PROCESS OF TRACK TENSIONING IN SME

TRACK TENSIONING WORK WITH JIG AND FIXTURE



MODIFICATION PROCESS OF TRACK TENSIONING IN SME

REVISED DATA COLLECTION

REASONS FOR DELAY IN TRACK TENSIONING WORKS .
(SOURCE OF INFORMATION – MAINTENANCE LOG BOOK)
PERIOD : FROM 20.04.2018 TO 20.07.2018

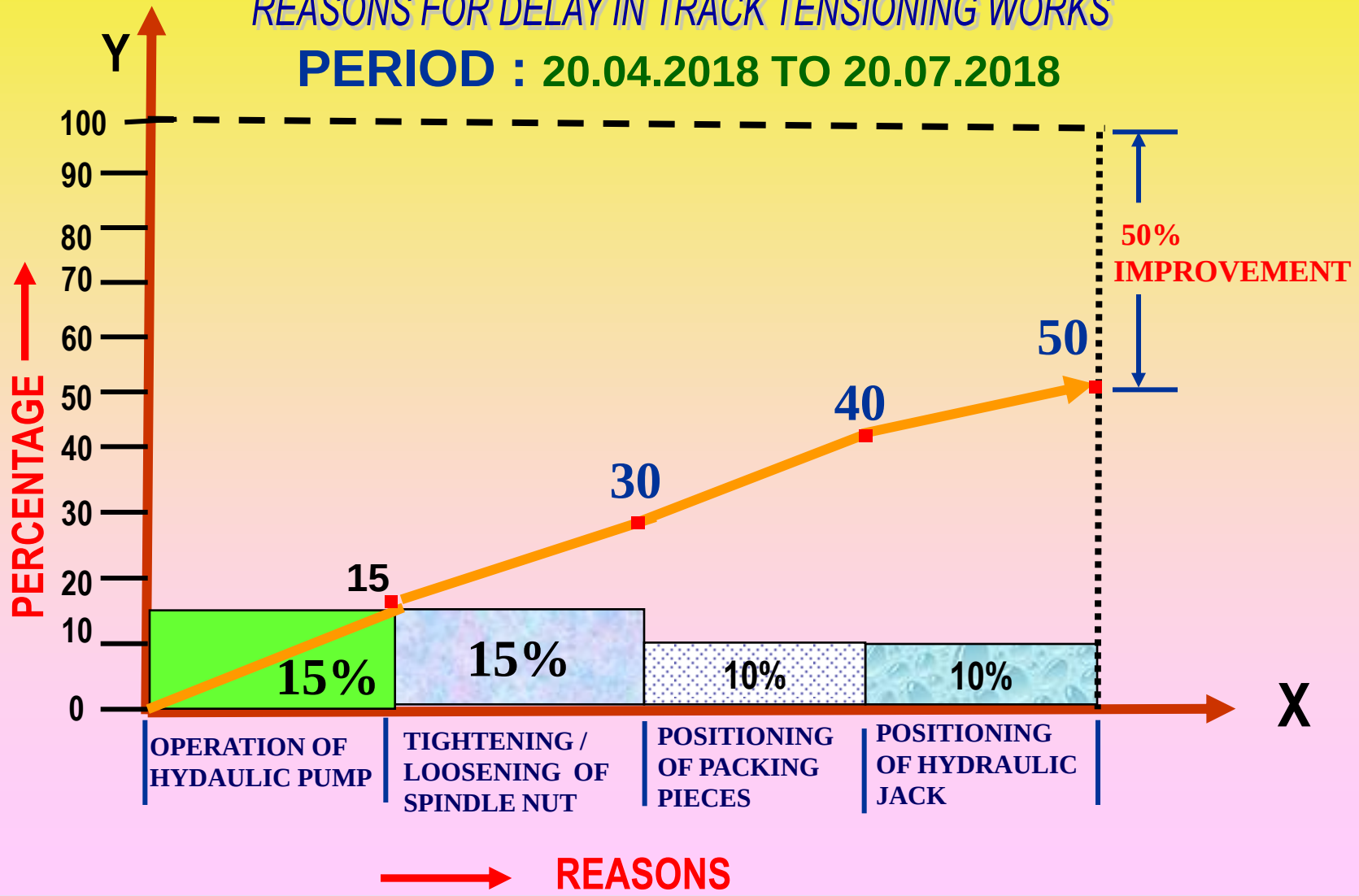
Sl. No.	EVENTS	TIME TAKEN (MIN.)	PERCENTAGE (%)	CUMULATIVE %
1.	OPERATION OF HYDAULIC PUMP	9	15	15%
2.	TIGHTENING / LOOSENING OF SPINDLE NUT	9	15	30%
3.	POSITIONING OF PACKING PIECES	6	10	40%
4.	POSITIONING OF HYDRAULIC JACK	6	10	50%

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

REVISED PARETO DIAGRAM

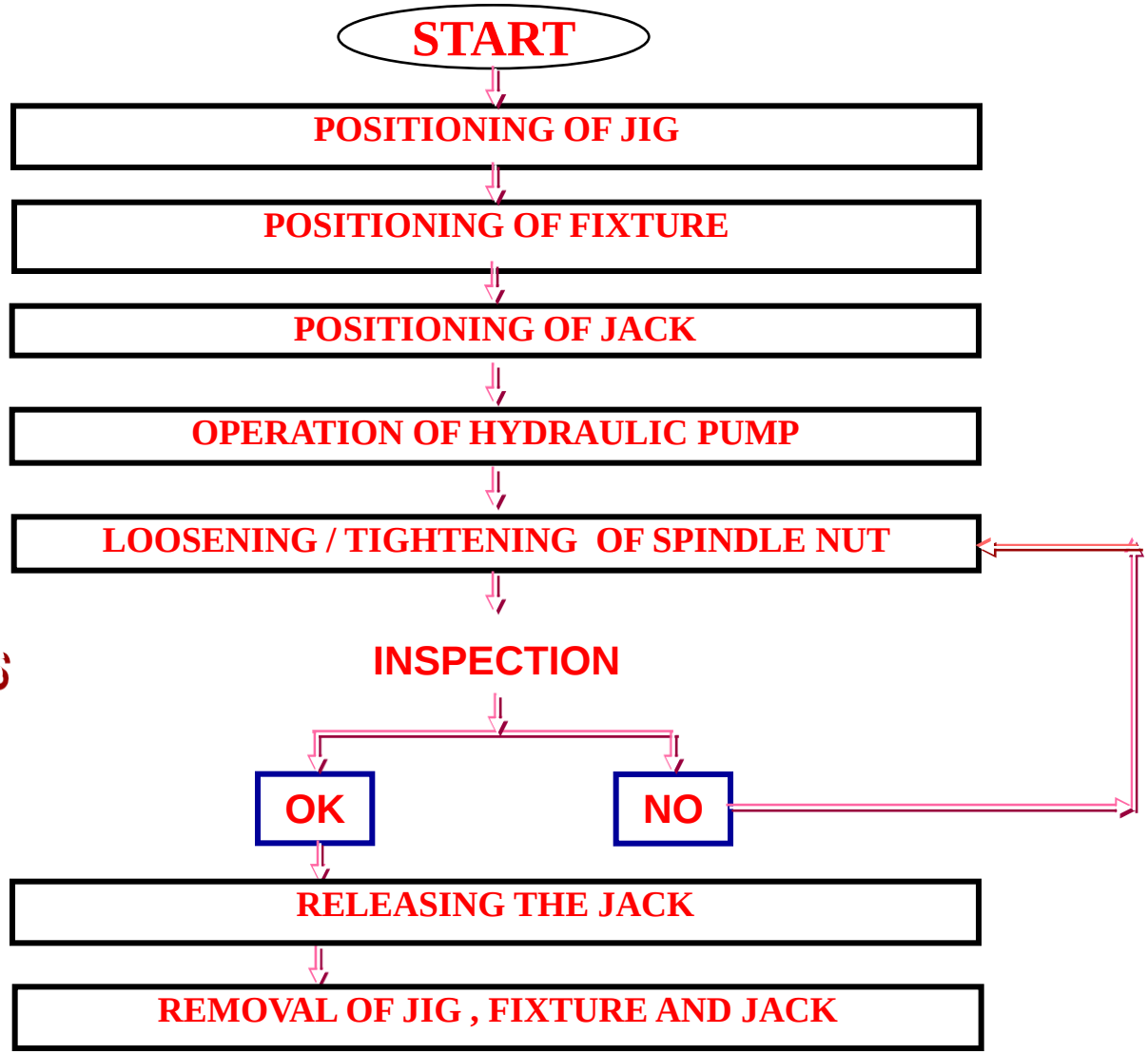
REASONS FOR DELAY IN TRACK TENSIONING WORKS

PERIOD : 20.04.2018 TO 20.07.2018



MODIFICATION PROCESS OF TRACK TENSIONING IN SME

FLOW DIAGRAM (AFTER)



7 OPERATIONS REQUIRED, 5 OPERATION SAVED

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 11

REGULAR IMPLEMENTATION

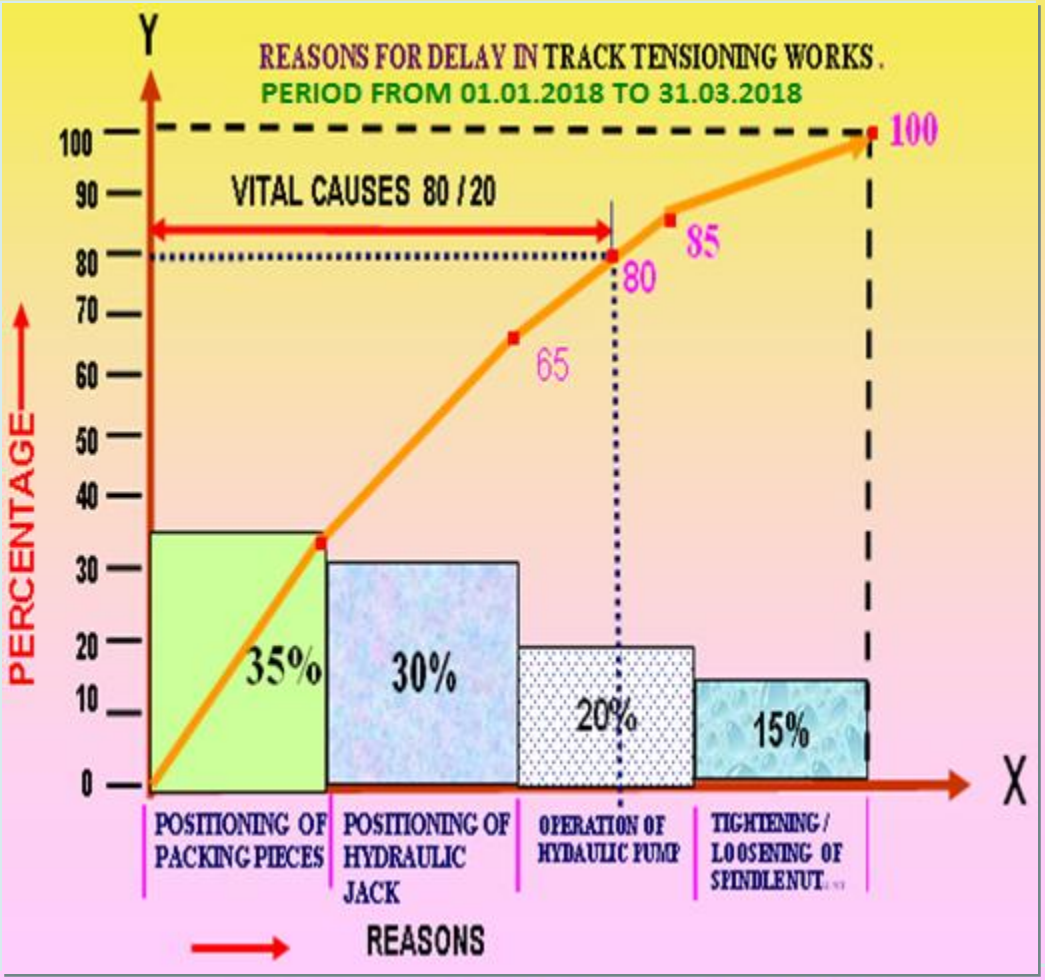
5W &1H ANALYSIS

WHAT? (IS TO BE IMPLEMENTED)	USING THE SPECIAL JIG AND FIXTURE
WHICH? (JIG AND FIXTURE)	DESIGNED BY QC CHALLENGE TEAM
WHEN? (IS THE IMPLEMENTION)	TRACK TENSIONING / DETENSIONING IN SME
WHY? (IS THE IMPLEMENTION)	TO REDUCE DOWN TIME
WHO? (IS RESPONSIBLE)	ALL QC TEAM MEMBERS
HOW? (TO IMPLEMENT)	ADOPTING THE MODIFICATION AT ALL WORK SPOTS.

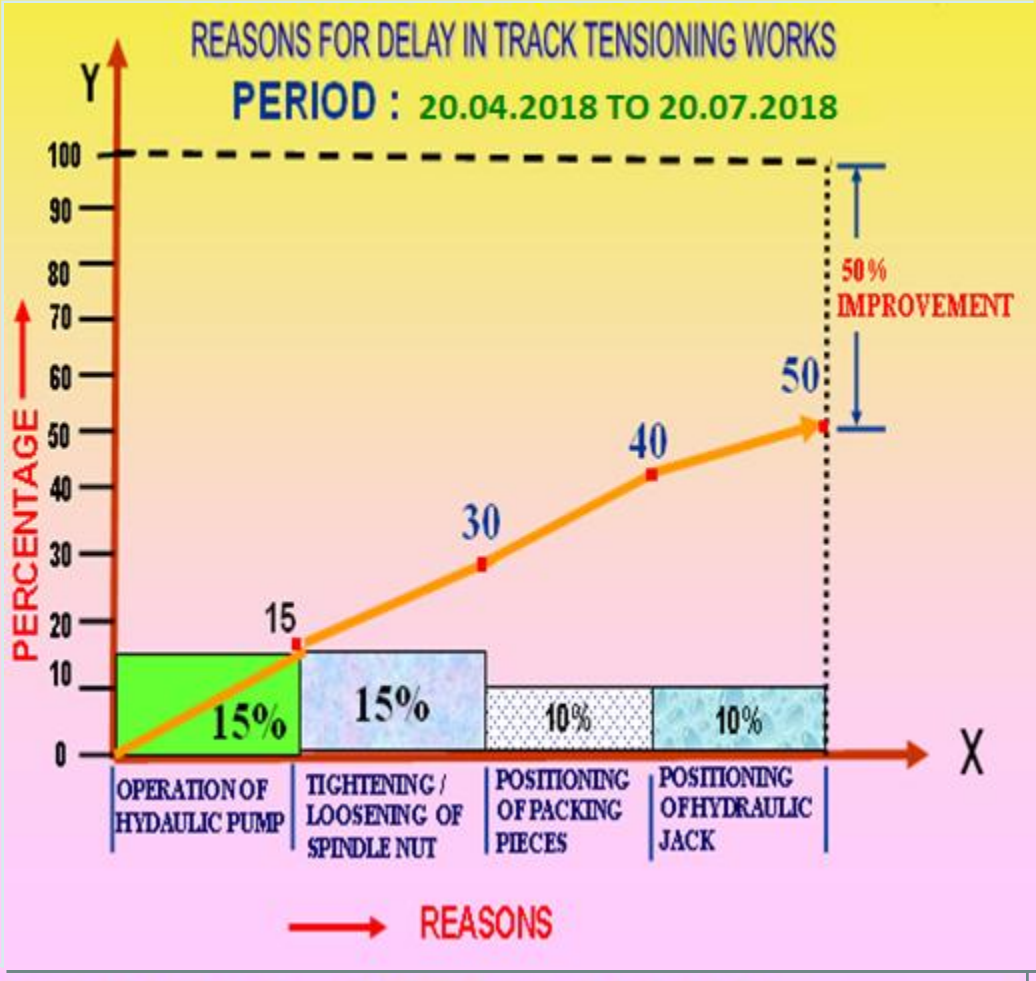
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

PARETO DIAGRAM

BEFORE



AFTER



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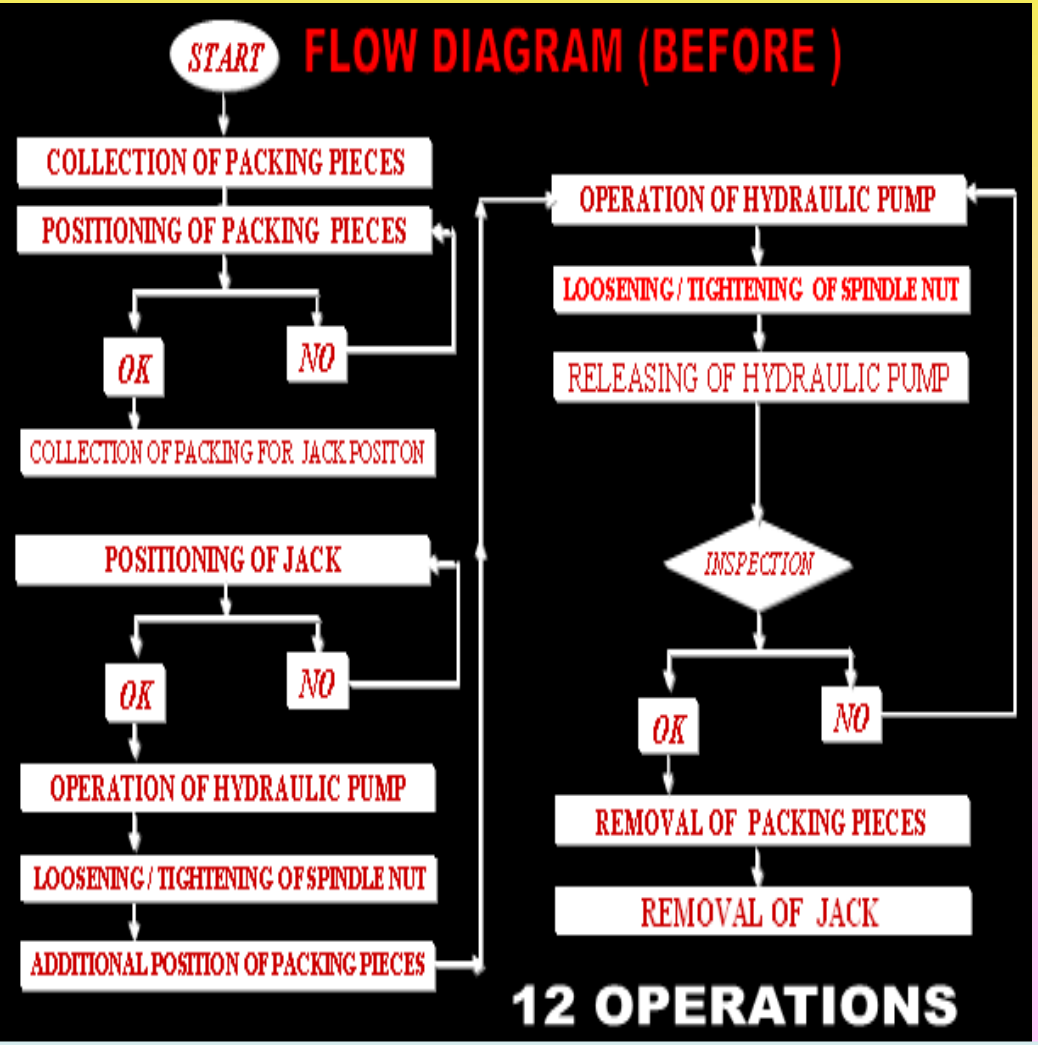
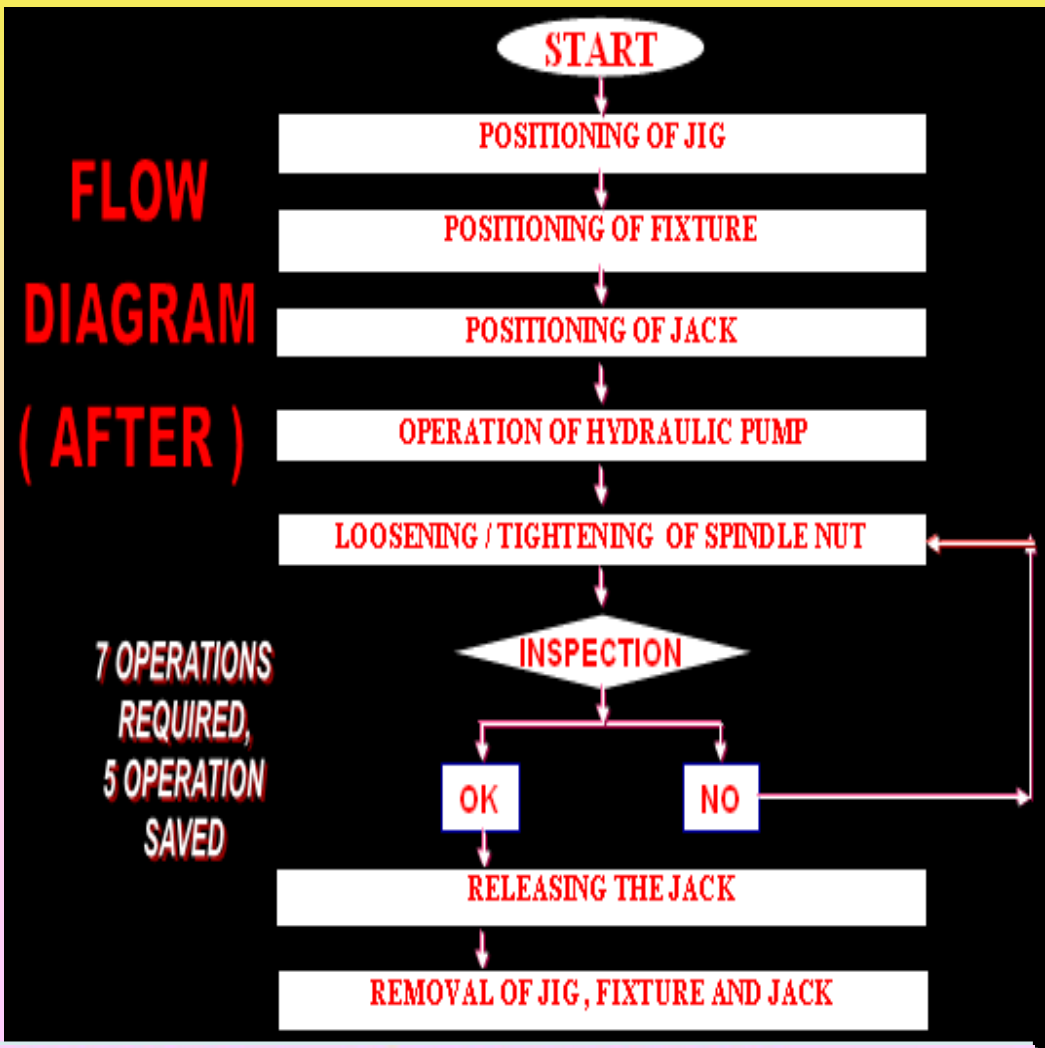
MODIFICATION PROCESS OF TRACK TENSIONING IN SME

FLOW DIAGRAM

BEFORE 12 OPERATION



AFTER 7 OPERATIONS



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NLC India Limited

(formerly Neyveli Lignite Corporation Limited)

Office of the Deputy General Manager SME/M-II

ADMINISTRATIVE OFFICE, MINE-II, NEYVELI-607 802.

CERTIFICATE

This is to certify that our members of "CHALLENGE" Quality Circle of SME Machine Maintenance crew, Mine-II have evolved tested and put into operation the findings of the case study "Modification process of track tensioning in SME's" in the actual field condition.

The special Jig & Fixture fabricated by the QC challenge is very useful for track tensioning and de-tensioning works in SME and reduce the downtime of Specialised Mining Equipments.

The above fabrication of Jig & Fixture has contributed to the enhancement of the productivity in Mine-II.

I wish them all success in future.

Sd xxxx

CHIEF MANAGER

OPERATION/MINE-II

NEYVELI-2

16.08.2018

DATE.....

NO.....

CHIEF MANAGER

Lignite Bench / Mine-II

NLC India Limited

(formerly Neyveli Lignite Corporation Limited)

Office of the Deputy General Manager SME/M-II

ADMINISTRATIVE OFFICE, MINE-II, NEYVELI-607 802.

CERTIFICATE

This is to certify that our members of "CHALLENGE" Quality Circle of SME Machine Maintenance crew, Mine-II have evolved tested and simplified the Track tensioning/De-tensioning works in SME.

The specially fabricated Jig & Fixture are performing well in the above maintenance works. The above fabricated Jig & Fixture are very useful and reduce the downtime of SME 's.

I wish them all success in future.

Sd xxxx

DEPUTY GENERAL MANAGER

SME-MM/MINE-II

NEYVELI-2
16.08.2018

NLC INDIA LIMITED. NEYVELI. TAMILNADU.

NLC India Limited

(formerly Neyveli Lignite Corporation Limited)

Office of the Deputy General Manager SME/M-II

ADMINISTRATIVE OFFICE, MINE-II, NEYVELI-607 802.

NON RECURRENCE CERTIFICATE

This is to certify that the introduction of the specially designed Jig & Fixture are supportive equipment for the track tensioning and de-tensioning works in the BWE 1571 (18-04-2018) owing to the result of quality circle case study be QC team "CHALENGE" of SME/MM Division.

The SME maintenance crew are tensioning and de-tensioning the track at much ease, and earlier time delay problems are not recurring since the introduction of the Jig & Fixture i.e. 18-04-2018 .

I wish them all success in future.

Sd xxxx

CHIEF MANAGER
OPERATION/MINE-II

NEYVELI-2
16.08.2018

COST BENEFIT ANALYSIS

COST OF IMPLEMENTATION

70 MM DIA SQ. THREAD SPINDLE AND NUT	.....	Rs 250/-
90 MM DIA 220MM LONG PIPE	.....	Rs. 100/-
MS ANGLE 25 MM 0.5 M	.....	Rs. 50/-
MS 100 MM CHANNEL 0.5 M	.....	Rs. 75/-
COST OF MAN POWER (1+1) X1 HRS	.....	Rs. 200/-
TOTAL COST	.....	Rs. 675/-

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

COST BENEFIT ANALYSIS

SUMMARY OF TANGIBLE BENEFITS

- BEFORE IMPLEMENTATION OF THE JIG AND FIXTURE, TRACK TENSIONING WAS DONE IN 60 MIN.
- AFTER IMPLEMENTATION OF THE JIG AND FIXTURE TRACK TENSIONING WAS DONE IN 30 MIN .

IN THREE MONTHS 28 TIMES OF TRACK TENSIONING / DE TENSIONING WAS CARRIED OUT IN ONE BWE AND ONE MTC

BEFORE IMPLEMENTATION DOWN TIME	= 28 HOURS
AFTER IMPLEMENTATION DOWN TIME	= 14 HOURS
MACHINE DOWN TIME SAVED	= 14 HOURS/ 3 MONTHS

BEFORE IMPLEMENTATION	AFTER IMPLEMENTATON
MAN POWER USED FOR TRACK TENSIONING WORKS 4 PERSONS FOR 60 MIN RS 10200	MAN POWER USED FOR TRACK TENSIONING WORKS 2 PERSONS FOR 30 MIN RS 2800
TOTAL COST SAVED = MAN POWER COST- IMPLEMENTED COST. = RS7400 –RS 675 = RS 6725 / 3 MONTH.	

PRODUCTION COST SAVED: DOWN TIME 14 HOURS SAVED AVERAGE PRODUCTION PER HOUR 900 TONES. PRODUCTION COST PER TONE Rs 900

COST OF PRODUCTION SAVED (900 X 900 X 14) = Rs. 1,13,40,000 / 3 MONTHS

COST OF PRODUCTION SAVED= Rs. 4,53,60,000/YEAR/ BWE/MTC

INTANGIBLE BENEFITS

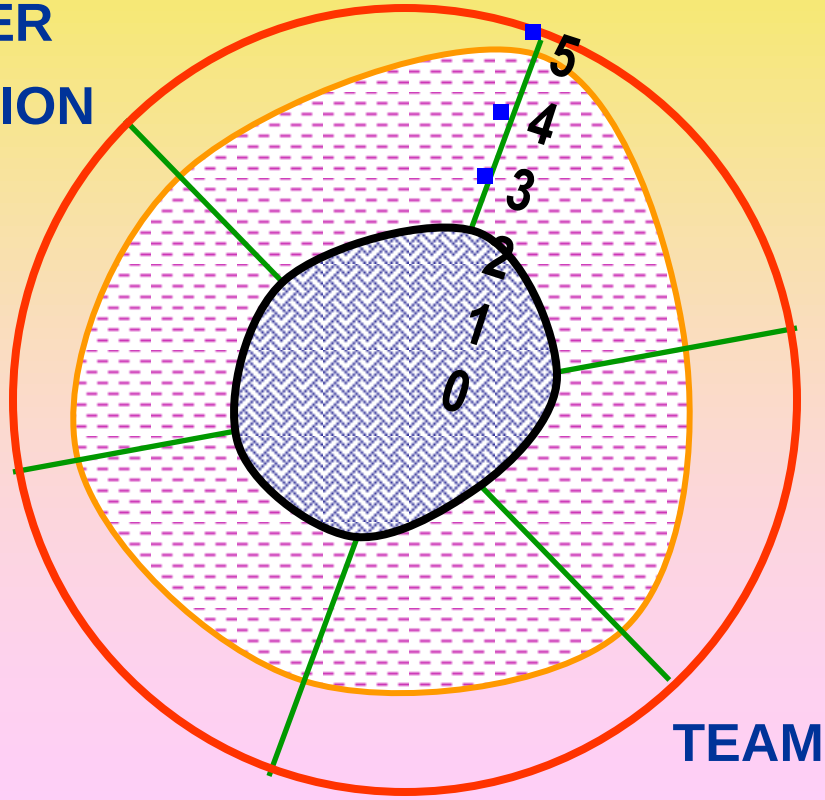
- JOB EASINESS IMPROVED
- JOB SATISFACTION IMPROVED
- RELATIONSHIP IMPROVED
- TEAM SPRIT DEVELOPED
- CUSTOMER SATISFACTION IMPROVED
- QUALITY OF WORK IMPROVED

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

RADAR CHART

JOB EASINESS

CUSTOMER SATISFACTION



1. BAD
2. FAIR
3. GOOD
4. VERY GOOD
5. EXCELLENT

JOB SATISFACTION

RELATIONSHIP

TEAM SPRIT

QUALITY OF WORK

BEFORE IMPLEMENTATION

AFTER IMPLEMENTATION

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MODIFICATION PROCESS OF TRACK TENSIONING IN SME

MILE STONE CHART

STARTED 27.03.2018 COMPLETED 19.04.2018

SL. NO	ACTIVITY. DAYS →	2	4	6	8	10	12	14	16	18	20	22	24	T	A
1	DEFINING THE PROBLEM													2	2
2	ANALYZING THE PROBLEM													2	2
3	IDENTIFYING CAUSES													4	2
4	FINDING ROOT CAUSE													2	4
5	DATA ANALYSIS													2	2
6	DEVELOPING SOLUTION													4	2
7	FORESEEING RESISTANCE													2	2
8	TRIAL IMPLEMENTATION													2	2
9	REGULAR IMPLEMENTATION													2	2
10	FOLLOW UP / REVIEW													2	2

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AA CHART

Sl. No.	AIM	ACHIEVEMENT
1	WORK SIMPLIFICATION	ACHIEVED
2	COST REDUCTION	ACHIEVED
3	CUSTOMER SATISFACTION	ACHIEVED
4	IMPROVE SAFETY	ACHIEVED

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

STEP 12

FOLLOWUP / REVIEW

RECURRENCE PREVENTION MEASURES

DISCUSSED WITH ALL OTHER MAINTENANCE CREWS REGARDING THE ADVANTAGES OF JIG AND FIXTURE.

DESIGN AND USE OF THE JIG AND IXTURE WAS DOCUMENTED AND SUBMITTED TO YARD CO-ORDINATION.

AN INSTRUCTION BOARD ALSO DISPLAYED NEAR THE TRACK AREA ABOUT THE USAGE OF JIG AND FIXTURE FOR TRACK TENSIONING WORKS

INFORMED TO THE UNIT HEAD ABOUT THE FABRICATION OF JIG AND FIXTURE

STANDARDISATION

1. DEMONSTRATED TO ALL MAINTENANCE INCHARGES ABOUT THE NECESSITY AND ADVANTAGE OF THE JIG AND FIXTURE.

2. UNIT HEAD WAS APPRAISED OF THIS MODIFICATION.

3. THIS TYPE OF JIG AND FIXTURE CAN BE USED IN THE SAME TYPE OF MACHINES.

MODIFICATION PROCESS OF TRACK TENSIONING IN SME

TOOLS/TECHNIQUES USED

STEP	QC STUDY	TOOLS/TECHNIQUES
1	PROBLEM IDENTIFICATION	BRAIN STORMING
2	SELECTION OF PROBLEM	STRATIFICATION , BAR GRAPH
3	DEFINE THE PROBLEM	WHY WHY ANALYSIS, FLOW DIAGRAM, 3 MU ANALYSIS
4	ANALYSE THE PROBLEM	4W & 1H ANALYSIS, DATA COLLECTION, PARETO DIAGRAM
5	IDENTIFICATION OF CAUSES	BRAIN STORMING, CAUSE & EFFECT DIAGRAM,
6	FINDING OUT ROOT CAUSES	WHY ? WHY? ANALYSIS
7	DATA ANALYSIS	DATA COLLECTION
8	DEVELOPING SOLUTION	BRAIN STORMING
9	FORSEEING PROBABLE ANALYSIS	ECT OPTION CHART
10	TRIAL IMPLEMENTATIONAND	PDCA, BRAIN STROMING, FLOW DIAGRAM, REVISED DATA & PARETO DIAGRAM
11	REGULAR IMPLEMENTATION	5W & 1H ANALYSIS, AA CHART, RADAR & MILE STONE CHART
12	FOLLOWUP / REVIEW	RECURRENCE PREVENTION MEASURES & STANDARDISATION

CONCLUSION

A RESULT OF A CREATIVE THINKING, GROUP DISCUSSION, INVOLVEMENT AND TEAM SPRIT WITH WHICH WE HAVE FABRICATED A JIG AND FIXTURE FOR TRACK TENSIONING/ DE TENSIONING WORKS SPECIALISED MINING EQUIPMENT

WITH HELP OF JIG AND FIXTURE WE ARE ABLE TO COMPLETE THE TRACK TENSIONING /DE TENSIONING WORKS IN 30 MINUTES AND REDUCE THE DOWN TIME OF SPECIALISED MINING EQUIPMENT BY 50%

FUTURE PLAN

WE WILL STUDY TO SOLVE THE FOLLOWING PROBLEMS.

FREQUENT FAILURE OF IMPACT ROLLER LINK PLATES AND BOLTS.

MISSING OF BUCKET TEETH AND TEETH BOLTS

FREQUENT MISSING OF BUCKET WEDGES.

PROBLEMS FACED IN TRACK TENSIONING SPINDLE BEND .

THANKS

OUR QC TEAM CHALLENGE

EXPRESSES ITS SINCERE GRATITUDE AND

HEARTFELT EXPRESSIONS TO …

NLCIL MANAGEMENT

NLCIL TRAINING COMPLEX

QUALITY CIRCLE FORUM OF INDIA,

JUDGES, QC & NON QC MEMBERS.

NLC INDIA LIMITED. NEYVELI. TAMILNADU.

THANKS

ANY QUESTIONS
&
SUGGESTIONS
PLEASE.