CONCEPT OF WATER NEUTRAL & IDENTIFYING FUNCTIONAL GAPS IN ATTAINING WATER NEUTRALITY

IN

SKF INDIA Ltd, PUNE

Final Year Project Report

Submitted by

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Under the guidance of

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BONAFIDE CERTIFICATE

Certified this titled ***"Concept of Water Neutral & Identifying Functional Gaps in Attaining Water Neutrality in SKF India Ltd"*** is the bona fide work of **C T PURNIMA (R080213011)** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported here in does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

INTERNAL GUIDE

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<u>TO WHOMSOEVER IT MAY CONCERN</u>

Dt:20 March 2015

This is to certify that Ms.C T Purnima, a M.Tech student with HSE of University of Petroleum & Energy Studies,Dehradun did her vocational training as well as Major Project on topic" **Concept of Water Neutral Factory"**at SKF India Ltd .Pune under the guidance of Mr.Atul Dharap & Mr.Advait Bhome starting from 19th January to 20th March 2015 as per above institution norms.

We wish her all the best for her future endeavors

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ABSTRACT

Water Neutrality is that one reduces the water footprint of an activity as much as reasonably possible and offsets negative externalities of the remaining water footprint. ‘Water Neutral’ generally does not mean that water use is brought down to zero, but that the negative economic, social and environmental externalities are reduced to much extent and that the remaining impacts are fully compensated. The idea of the concept is to stimulate individuals and corporations that undertake water consuming or polluting activities to make their activity ‘water neutral’ by reducing water consumption and pollution & by compensating the negative impacts of remaining water consumption and pollution through investing in projects that promote the sustainable and equitable use of water within the environment and community that is affected. An increasing number of businesses recognize that not only their operations, but also their supplies depend and impact on natural water systems. Hence, this approach offers a great opportunity to translate water footprint impacts into action to mitigate those impacts within both communities and business. In this project the concept of water neutrality is discussed in detail and the concept is applied to a bearing manufacturing industry. The functional gaps are identified and necessary strategies are recommended to implement them in order to reduce the functional gaps in attaining water neutrality.

Keywords: *Water Neutral, Water footprint, functional gaps, consumption, manufacturing industry, etc.*

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I pay my sincere thanks to ***SKF INDIA Ltd*** for providing an invaluable opportunity to carry out my thesis work at SKF Pune Plant. The project has helped me immensely in developing an understanding of various practical techniques applicable in the plant.

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C T PURNIMA

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LIST OF ABBREVIATIONS

ABC	Associated Bearings Company
DGBB	Deep Groove Ball Bearing
ETP	Effluent Treatment Plant
F/OD	Face & Outer Diameter
SKF	SVENSKA KULLAGERFABRIKEN
STP	Sewage Treatment Plant
TRB	Tapered Roller Bearing
UNESCO	United Nations Educational, Scientific and Cultural Organization
WWF	World Wide Fund

CHAPTER 1

INTRODUCTION

1.1 GENERAL

Worldwide water use for human purposes can be split into three major categories: around 70 percent is used for farming, 20 percent for industry and the remaining 10 percent for domestic activities. Demand for water will increase in all three of these areas as populations grow and as countries become keener in changing an area or country so that it builds factories and starts manufacturing lots of things. It is guessed that by 2020 around two-thirds of the world's population will be living in water-stressed countries.

1.1.1 Use of Water in Industries

Water is a vital commodity in many manufacturing industries. It is used in production processes, process utilities and for a range of other miscellaneous purposes (Dupont and Renzetti, 2001). Water is demanded, often in large volumes, by industries as process inputs in most industries. Production processes use water either as a cleaning agent, contaminant weaker, or as part of the final product, while process utilities such as cooling towers, boilers and air handling units, use water to carry out heat transfer, steam production and to make up water loss due to evaporation. Employee sanitation and general plant cleaning usually make up equal to water used for other miscellaneous purposes. However, in most industries it is basically used as input and mass & heat transfer media. In these industries a very small fraction of water is actually used and lost. Most of the water is actually meant for non-consumptive process uses and is finally discharged as effluent.

But all water used in the different industry is not totally consumed. Generally, almost all the industries generate waste water that needs extremely important attention. Water use in industry is a double-edged sword. On one hand it puts huge pressure on local water supplies. On the other, wastewater discharged from the industry pollutes the surrounding conditions. Since water is vital to many manufacturing processes and activities, its efficient use should be a priority in order to make sure that water scarcity and increasing water import taxes will have very little effects on production. Identifying opportunities to improve process water use efficiently usually involves the use of different water management success plans such as the water audit, process integrity and use of advanced water treatment technologies. Water management success plans provide useful understanding of possible process changes that may lead to an increase in water use efficiency and eventually water savings.

1.1.2 Effluent Treatment Plant

Industrial wastewater treatment covers the mechanisms and processes used to treat waters that have been contaminated in some way by anthropogenic industrial or commercial activities prior to its release into the environment or its re-use. Most industries produce some wet waste although recent trends in the developed world have been to minimize such production or recycle such waste within the production process. However, many industries remain dependent on processes that produce wastewaters.

So, industries produce wastewater, otherwise known as effluent, as a bi-product of their production. The effluent contains several pollutants, which can be removed with the help of an effluent treatment plant (ETP). The "clean" water can then be safely discharged into the environment.

Advantages of waste water systems

Manufacturers face strict regulations on discharge and waste. Non-compliance can lead to expensive fees and operations interference. A wastewater treatment skid will help you:

- Stay in compliance
- Reduce hauling and off-site treatment costs
- Eliminate municipal fees & reduce supply costs by recovering production materials out of the waste-stream for re-use
- Eliminate unnecessary water usage during processing

1.2 NEED FOR THE STUDY

The concept of water neutrality has arisen as a response to plans for industrial growth in areas where water resources are under pressure. Without water neutrality, or a similarly robust response, industrial growth will lead to increased demand for water at a time when climate change threatens to reduce water supply. This presents clear risks to the water environment. The aim of this report is to critically discuss the various strategies which help the company becoming Water Neutral.

1.3 OBJECTIVE OF THE STUDY

- Development of step by step procedure to atain water neutrality in SKF.
- To explore potentials for sustainable actions in reducing ***water footprint*** of SKF, Pune Factory.
- To identify the number of water sources to the company.
- Defining, measuring and reporting the current water consumption pattern of the company.
- Current water stream map development.
- Identification of improvement points & Suggesting control measures.
- To increase the awareness for conservative use of water among all the people in SKF at all levels including contractors.

CHAPTER 2

LITERATURE REVIEW

Sl. no	Objective &Study Aspect	Findings	Conclusions	References
1.	This paper presents a Computer simulation of the water balance of catchments for estimating runoff from rainfall in Australia	Water balance modelling for continuous simulation of catchment water balance through dry periods as well as wet & the models that calculate a continuous water balance without need for assumptions to deal with particular storm events.	The scarcity of stream gauging stations over much of the continent made assessment of available water difficult, and resulted in an emphasis on water yield instead of flood estimation in modelling studies	Boughton; 2004
2.	This paper explores the possibility of using a process cycle where wastewater treatment is intended for water recycling, taking into account the mass balance of materials other than water and the energy balance as well.	• Estimating the water balance • Water Pinch techniques & Water Scan techniques are carried out for Overall process optimization • By regenerating the remaining wastewater streams and reusing them as rinsing water.	A step-by-step study of the water cycle in a company allows reducing significantly the water consumption. • Making the water balance is useful to detect unknown water consumption, and is the basis for further optimization. • Water Pinch or Water	Van der Bruggen & Braeken; 2005

			Scan methods allow deciding which streams can be reused, directly or after regeneration.	
3.	This paper presents a step-by-step approach to the water balance and a process for system evaluation will be presented.	• Water balance calculations • Uses of water balance • Cost • Identifying Inefficiencies • Reduce, reuse, recycle	A thorough water balance across each process can identify inefficiencies in water use or distribution and in wastewater collection and treatment	Thomas A. Blair; 2007
4.	This paper discusses about the water pollution by industrial effluents in INDIA	• Water quality management policy in INDIA • Regulations of industrial effluents • Effluent discharge scenario under various enforcement market conditions & strategies for regulations	Current regulatory system in india for control of industrial discharges need a complete improvement in terms of standard settings, monitoring & enforcement	T Rajaram, Ashutosh Das; 2007

5.	This paper presents a methodology catering to these characteristics of the water use issue and demonstrated on an industrial case study from the biotech industry.	The characterization model was applied in a real case study using data provided by the company Novozymes for the production and use of enzymes in the treatment of cotton to produce textiles, replacing the use of chemicals in the conventional production	With the presented characterization method the basis has been laid for including assessment of the environmental impacts from water use in LCA of industrial products and to allow the impacts from industry's water use to become an integrated part of the sustainability assessment of industry.	Le´vova´ & Hauschild ; 2011
6.	This paper presents an uncertainty analysis and groundwater measurements to improve the confidence of river water balance estimates	• Sources of uncertainty in a water balance • Uncertainty analysis • Water balance	This paper applies a Monte Carlo simulation to estimating a water balance for three reaches of the Broken River, with the residual term interpreted as the net flux between the groundwater and the river An important difference between the ephemerality of gauged and ungauged tributaries in the Broken River system was identified.	Adams et al; 2013
7.	This paper presents an approach to industrial water conservation – a case study involving two large manufacturing companies based in Australia	Firstly, the water audit completely characterized all water streams found	Advanced water treatment technologies such as membrane filtration processes play a major role in the reclamation of water in	Bernard A. Agana , et al; 2013

		Secondly, the process integration strategy which utilized commercially available water pinch software has successfully identified possible water reuse opportunities Finally, the water recycling strategy showed the suitability of different membranes for treating specific wastewater streams	manufacturing industries worldwide.	
8.	This paper deals about water footprint	• Water & carbon footprints • Economic and policy implications of water footprints • Computing the components of the water footprint	Water footprints are different than carbon footprints. Water footprints are incorrectly assessed on an absolute, rather than a relative basis	Chris Perry; 2014

CHAPTER 3

SVENSKA KULLAGERFABRIKEN (SKF)

3.1 Introduction of SKF Company

SKF has been a leading global technology provider since 1907. Its fundamental strength is the ability to continuously develop new technologies – then use them to create products that offer competitive advantages to our customers. They achieve this by combining hands-on experience in over 40 industries with their knowledge across the SKF technology platforms: bearings and units, seals, mechatronics, services and lubrication systems. Their success is based on their knowledge, people, and commitment to SKF Care principles.

"Increase efficiency, decrease energy"

The focus of SKF's technology development today is to reduce the environmental impact of an asset during its lifecycle, both in our own and our customers' operations. The SKF beyond Zero product portfolios is the latest example of what SKF has to offer in this area. SKF's roots in India can be traced back to 1923, when a trading arm of SKF Group was set up in Kolkata. Since then SKF has been serving the Indian market with high quality bearings for over 3 decades. SKF India Ltd was incorporated in the year 1961 as a result of collaboration between AB SKF, Associated Bearing Company limited and Investment Corporation of India Ltd and the first manufacturing plant was commissioned in Pune in the year 1965. Today, with 5 manufacturing facilities located in Pune, Bangalore, Ahmadabad, Mysore, and Haridwar, with more than 11 sales offices across India and a supplier network of over 300 distributors, SKF continues to serve the varied markets with reliable solutions. Over the years the company has evolved from being a pioneer ball bearing manufacturing company to a knowledge-driven integrated solutions provider, helping customers achieve sustainable and competitive advantage.

3.2 Water Requirements

- **Domestic:** Most office accommodation is fitted with kitchens, toilets and bathroom all of which can contribute significantly to the water use of a business. Furthermore, many larger businesses, such as mines, provide housing for their employees. The water requirements for day-to-day living purposes, such as health and hygiene, are the same as those in any other urban center.

- **Irrigation:** Certain businesses develop landscaped gardens and lawns which are maintained to provide a pleasant aesthetic environment and which promote a good corporate image. These tend to be well watered, on top of which, many of the gardens contain exotic plants which are thought to have substantially higher water requirements than indigenous plants.

- **Process:** One of the major uses of water in the Sector is that related to the actual manufacturing processes and the end product. Water use may be consumptive and non- consumptive.

- **Cleaning:** Although water use for cleaning can be related to a process, it is also used for non-process related cleaning purposes. The washing down of the floors of a premises or the cleaning of a fleet of vehicles are such examples, and which can result in significant usage.

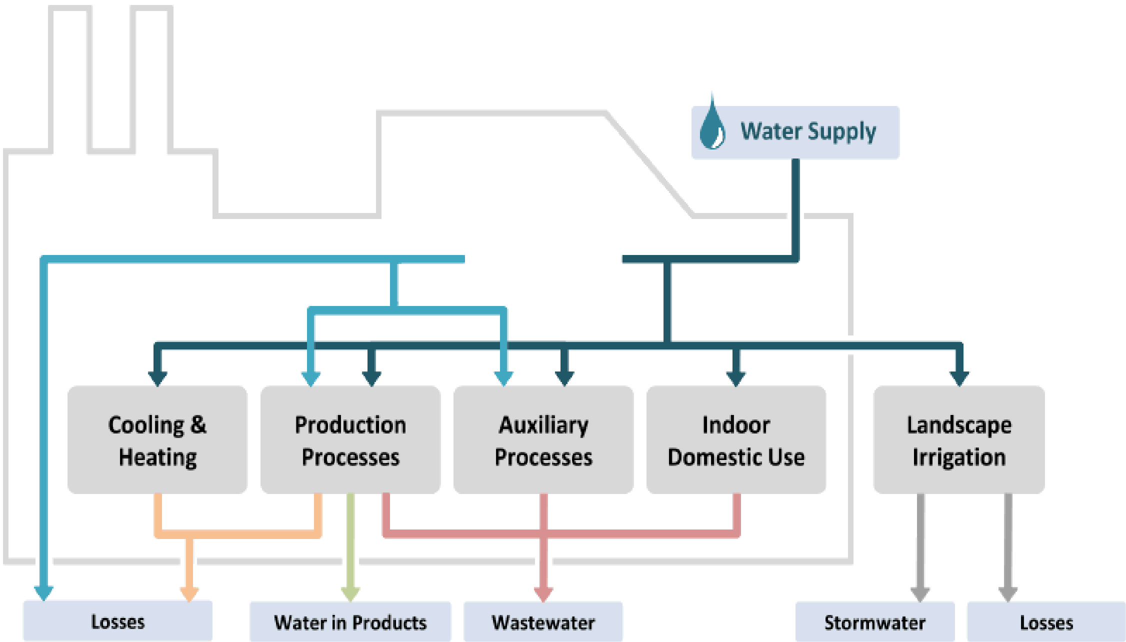

Fig1: Water Distribution Network

- **Cooling:** Again, cooling is often processes relate, however, there are a number of non-process related cooling requirements which utilize water. Refrigeration and air conditioning are typical examples thereof.

- **Firefighting:** Reticulation systems in businesses are often designed to meet the requirements of firefighting, which often well exceed the requirements for the other water uses within a business, especially in terms of pressure. The levels of service for the others uses may therefore be excessive leading to excessive use.

- **Water treatment:** Certain business treats their own water to achieve the standards necessary for their process requirements. Furthermore, some businesses also have to treat their effluent to a standard to meet receiving water quality objectives or the requirements to discharge into local sewer systems. Often these treatment facilities are inefficient which may lead to significant quantities of water being wasted.

CHAPTER 4
WATER NEUTRALITY

4.1 WATER NEUTRAL

The idea of the water-neutral concept is to stimulate individuals and corporations that undertake water consuming or polluting activities to make their activity 'water neutral' by reducing water consumption and pollution and by compensating for the negative impacts of remaining water consumption and pollution through investing in projects that promote the sustainable and equitable use of water within the environment and community that is affected. Water consumption and pollution can be reduced for example by investing in water saving technology, water conservation measures and wastewater treatment. Compensation for negative impacts can be done for example by investing in improved watershed management.

Water neutrality is an important but relatively new concept for managing water resources in the context of a new development and the associated demand for water. The basic concept of water neutrality is that the demand for water should be the same after a new development is built as it was before. Water neutrality could be achieved in a combination of ways. New developments could be made superefficient, but will still require water to fulfil essential needs. This water can be 'offset' by retrofitting existing buildings within the area with more efficient devices and appliances, expanding metering and introducing innovative tariffs for water use, which reward moderate water users. Water companies should also reduce demand by improving management of leakage where it is cost-effective. These are all techniques applied within the current water resource management planning process.

Water neutrality may give additional focus to these activities and a coherence to demand management activities that balances the coherence of supply-side options. Taking a strict interpretation, no individual or entity that uses water can ever be entirely water neutral, as water use cannot be reduced to zero. It is possible, however, that the term used in a consistent and transparent manner could drive positive action on water issues and will, therefore, have potential, similar to that of carbon neutrality. There are similarities between the water neutral concept and the carbon neutral concept. It is possible to take lessons from 'carbon', but only as far as the similarities go, because water has its own very specific characteristics – like its geographically confined nature and the fact that most water is a renewable and not a fossil resource – to which the carbon lessons will not fully apply.

4.2 Definitions:

Blue water – Fresh surface and groundwater i.e., the water in freshwater lakes, rivers and aquifers.

Green water – The precipitation on land that does not run off or recharge the groundwater but is stored in the soil or temporarily stays on top of the soil or vegetation. Eventually, this part of precipitation evaporates or transpires through plants. Green water can be made productive for crop growth.

Grey water footprint – The grey water footprint of a product is an indicator of freshwater pollution that can be associated with the production of a product over its full supply chain. It is defined as the volume of freshwater that is required to assimilate the load of pollutants based on natural background concentrations and existing ambient water quality standards. It is calculated as the volume of water that is required to dilute pollutants to such an extent that the quality of the water remains above agreed water quality standards

Water consumption – The volume of freshwater used and then evaporated or incorporated into a product. It also includes water abstracted from surface or groundwater in a catchment and returned to another catchment or the sea. It is important to distinguish the term 'water consumption' from the term 'water withdrawal' or 'water abstraction'.

Water neutral – A process, product, consumer, community or business is water neutral when: (i) Its water footprint has been reduced where possible, particularly in places with a high degree of water scarcity or pollution; and (ii) When the negative environmental, social and economic externalities of the remaining water footprint have been offset (compensated). In some particular cases, when interference with the water cycle can be completely avoided – for example, by full water recycling and zero waste – 'water neutral' means that the water footprint is nullified; in other cases, such as in the case of crop growth, the water footprint cannot be nullified. Therefore 'water neutral' does not necessarily mean that the water footprint is brought down to zero, but that it is reduced as much as possible and that the negative economic, social and environmental externalities of the remaining water footprint are fully compensated.

Water footprint – The water footprint is an indicator of freshwater use that looks at both direct and indirect water use of a consumer or producer. The water footprint of an individual, community or business is defined as the total volume of freshwater used to produce the goods and services consumed by the individual or community or produced by the business. Water use is measured in terms of water volumes consumed (evaporated or incorporated into a product) and/or polluted per unit of time. A water footprint can be calculated for a particular product, for any well-defined group of consumers (for example, an individual, family, village, city, province, state or nation) or producers (for example, a public organization, private enterprise or economic sector). The water footprint is a geographically explicit indicator, showing not only volumes of water use and pollution, but also the locations.

Water footprint offsetting – Offsetting the negative impacts of a water footprint is part of water neutrality. Offsetting is a last step, after a prior effort of reducing a water footprint insofar reasonably possible. Compensation can be done by contributing to (for example, by investing in) a more sustainable and equitable use of water in the hydrological units in which the impacts of the remaining water footprint are located.

4.3 INDUSTRIAL APPLICATIONS:

The water-neutral concept was conceived by Pancho Ndebele at the 2002 Johannesburg World Summit for Sustainable Development (Water Neutral, 2002). The idea at the time of the Summit was to quantify the water consumed during the conference by delegates and translate this into real money. Delegates, corporations and civil society groups were encouraged to make the summit water neutral by purchasing water-neutral certificates to offset their water consumption during the ten-day summit, with the offset investment being earmarked for the installation of pumps to water needy communities in South Africa and for water conservation initiatives. These resulted in the development of a simple water neutral calculator aimed to help visitors to South Africa estimate their water footprint during their stay and calculate the offset price to be paid (Chapagain and Hoekstra, 2007). This calculator is currently being implemented as part of a strategy of the Water Neutral Foundation in Johannesburg to offset the water footprints of visitors to South Africa by selling water offset certificates and thus raising funds to be spent on projects that contribute to a more sustainable and equitable water use in South Africa.

Since about mid-2007, the water-neutral concept is being discussed within various communities, including academia, environmental NGOs and businesses, as a potential tool to translate water footprints into modes of action. A group of stakeholders (representatives from University of Twente, WWF, The Coca Cola Company, Nestlé, Suez, Aquafed, the World Business Council on Sustainable Development and UNESCO-IHE) has had two informal meetings about the concept of water neutrality: in September 2007, at WWF in Zeist, the Netherlands, and in January 2008, at UNESCO-IHE in Delft, the Netherlands. More recently, others have joined the discussions, including the Nature Conservancy and the World Water Council.

CHAPTER 5
METHODOLOGY

5.1 Methodology/Steps Involved To Achieve Water Neutrality in SKF

SKF is mostly focused on, to explore potentials for sustainable actions in reducing water foot print of factory and achieve the targets such as:

- To reduce the usage of blue water (from rivers, wells)
- To store more of green water (rain water)
- To increase recycling and reuse of grey water (treated water)
- To increase the awareness for conservative use of water among all the people in SKF at all levels including contractors

The following steps are followed to achieve the above targets:

Step 1: Water network mapping

Step 2: Water discharge/consumption point identification

Step 3: Water measurement format development and measurements

Step 4: Current water stream map development

Step 5: a) Identification of improvement points/*kaizens*

b) Identification of potential for rainwater harvesting and its use

c) Use of treated water/closing the loop

Step 6: Implementation of improvement points

CHAPTER 6
RESULTS & DISCUSSIONS

Initially all the water sources to the company are identified and a water network map is developed for brief understanding as following

6.1 Sources Identification:

1. Maharashtra Industrial Development Corporation (MIDC) – Regularly under use
2. Rainwater Harvesting - Used only in Rainy Season
3. Treated water from ETP/STP
4. Tankers & Bore Wells – Used during emergency

MIDC is the vital element for supplying huge volumes of water required for the company. All the water from MIDC main pipeline of 8 inches is collected in underground storage tank which further is pumped and stored in a reservoir tank holding a capacity of 5 lakh liters. The north outlet of the reservoir is utilized for the north colony. The south outlet from the reservoir is utilized for production process in the company.

Rainwater Harvesting system can be made functional only in rainy seasons. It is estimated that in 2013 the total water collected is around 93m^3/day. This was made to utilize at canteen area. And in 2014 the total water collected is around 120m^3/day which was utilized at canteen & bin washing areas.

Treated water from ETP/STP holds very little volume. Capacity of STP is 200m^3/day. Capacity of ETP is 150m^3/day.

Tankers & Bore Wells are considered only during emergency conditions.

The following water network map represents water distribution from the storage reservoir to various consumption points in the industry. Water flow meters are also represented.

STEP 1: WATER NETWORK MAPPING

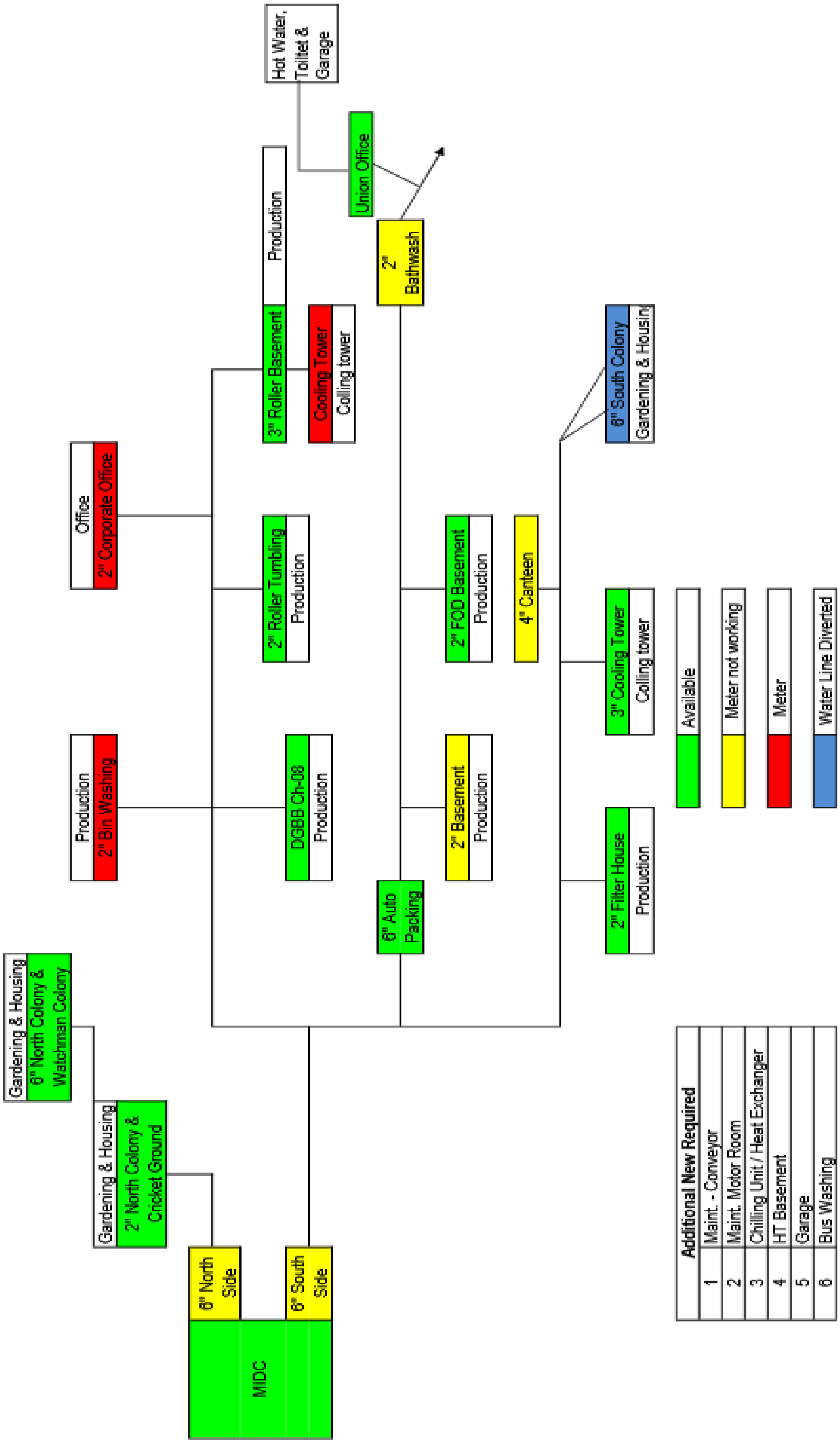

Fig 2: Water Network Mapping

6.2 STEP 2: WATER DISCHARGE/CONSUMPTION POINT IDENTIFICATION

SL.NO	**WATER FLOW METERS LOCATION :**		**CONDITION**	**CONTROL AREA**
	LOCATION	**PIPE SIZE, INCH**		
1	**WATER TOWER SOUTH COLONY**	6"	Working	Factory
2	**WATER TOWER NORTH COLONY**	6"	Working	CLF & MD
3	**AUTO PACKING OUTSIDE**	6"	Working	Factory
4	**FILTER HOUSE**	2"	Working	Coolant Tanks
5	**COOLING TOWER**	3"	Working	Cooling
6	**CANTEEN OUTSIDE**	4"	Not working	Canteen
7	**SOUTH COLONY**	6"	Not working	Guest House
8	**GRINDING BASEMENT**	2"	Not working	Coolant Central System
9	**GRINDING BASEMENT/F/OD**	2"	Not working	Coolant System(F/OD)
10	**ROLLER BASEMENT**	3"	Working	Coolant System
11	**UNION OFFICE FRONT SIDE**	2"	Working	Wash Rooms

12	**BATH WASH**	2"	Working	Wash Rooms
13	**OUT SIDE CH-08**	2"	Working	Coolant system of ch-10
14	**B-GATE TERRACE**	2"	Working	Wash Rooms (South side)
15	**CRATE WASHING AREA**	2"	Meter required	Crate Washing
16	**ROLLER TUMBLING**	2"	Working	Tumbling
17	**TREATED STP WATER**	2"	Working	STP outlet
18	**NEW COOLING TOWER**	PROPOSED	----	For AC’s
19	**RAINWATER HARVESTING**	2"	Working	Canteen
20	**FIRE HYDRANT STORAGE**	6"	Working	Fire Fighting

Table 1: Water Discharge / Consumption Point Identification

LOOPHOLES:

- For water consumption at canteen area, water flow meter is not in working condition.
- At south colony i.e,. guest house area water is been diverted to another parallell line where there is no flow meter instead of in the line where flow meter is placed.
- At grinder basement location meters are not in working condition & need to be checked.
- At crate washing area meter was removed long back to compensate its requirement for highly demanding area.
- There was a proposal made to accomodate one flow meter at new cooling tower.

SUGGESTIONS:

- Seperate meters required for water used at crate washing area and for new cooling tower.
- Reason behind the water diversion at south colony should me noted and appropriate measures should be taken.
- Leaks anywhere identified need to be communicated to higher management.

Water Leaks Identified

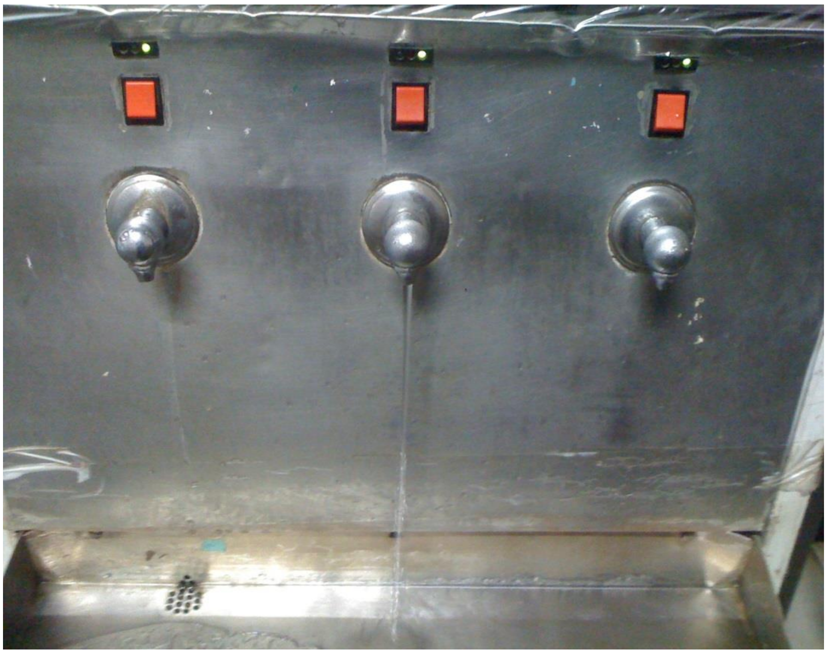

Fig 4: Leakage at Water Cooler

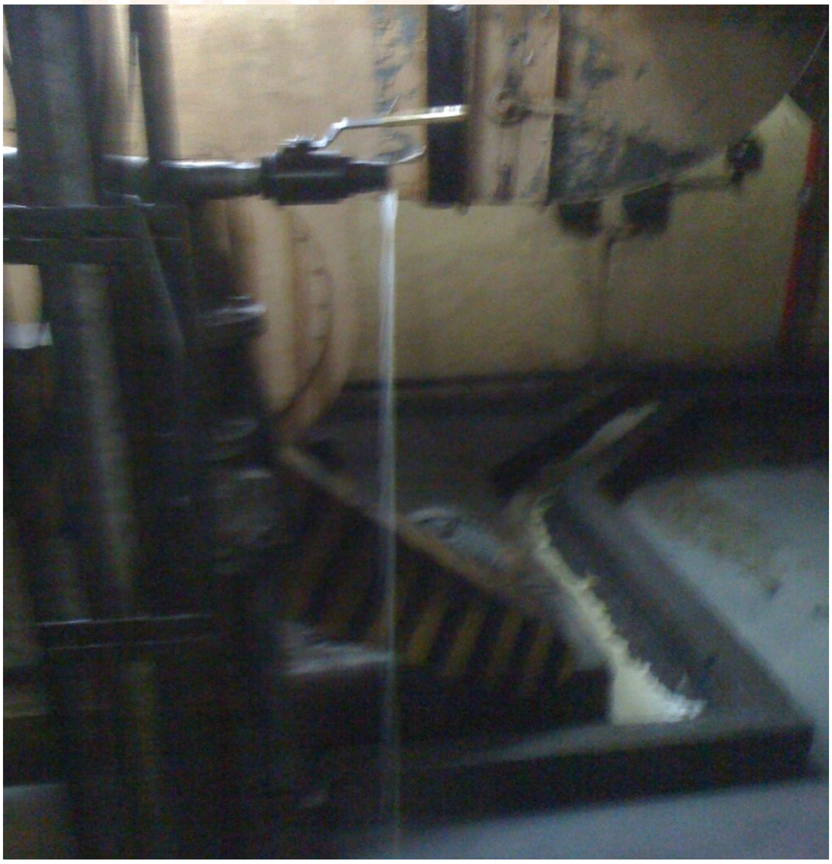

Fig 5: Leakage at Grinding Basement

6.3 STEP 3: WATER MEASUREMENT FORMAT DEVELOPMENT AND MEASUREMENTS, m^3

S.No	LOCATION	IN CH	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb
1	**WATER TOWER SOUTH COLONY**	**6"**	12824*10	12848*10	12867*10	12883*10	12901*10	12918*10	12933*10	1295*10	12974*10	12993*10	13008*10
2	**WATER TOWER NORTH COLONY**	**6"**	10084*10	10089*10	10094*10	10099*10	10104*10	10106*10	10109*10	10119*10	10126*10	10129*10	10134*10
3	**AUTOPACKING OUTSIDE**	**6"**	12688	12693	12698	12702	12706	12710	12714	12719	12724	12728	12733
4	**FILTER HOUSE**	**2"**	17023	17040	17054	17068	17084	17102	17122	17137	17153	17163	17187
5	**COOLING TOWER**	**3"**	47593	47613	47633	47654	47674	47695	47719	47739	47760	47779	47799
6	**CANTEEN OUTSIDE**	**4"**	8999	8999	8999	8999	8999	8999	8999	8999	8999	8999	8999
7	**SOUTH COLONY**	**6"**	715	715	715	715	715	715	715	715	715	715	715
8	**GRINDING BASEMENT (DGBB-CH-02)**	**2"**	416	416	416	416	416	416	416	416	416	416	416
9	**GRINDING BASEMENT/F/OD**	**2"**	4026	4026	4026	4026	4026	4026	4026	4026	4026	4026	4026
10	**ROLLER BASEMENT**	**3"**	33193	33225	33252	33285	33312	33348	33385	33414	33454	33482	33518

11	**UNION OFFICE FRONT SIDE**	**2"**	12004	12011	12018	12027	12036	12042	12047	12055	12062	12068	12076
12	**BATH WASH**	**2"**	44101	44104	44125	44213	44218	44221	44223	44232	44239	44235	44238
13	**OUT SIDE CH-08**	**2"**	804	804	807	808	809	809	810	810	812	814	1800
14	**"B" GATE TERRACE**	**2"**	19511	19518	19524	19532	19538	19542	19544	19551	19558	19564	19572
15	**CRATE WASHING AREA**	**2"**											
16	**ROLLER TUMBLING**	**2"**	1408	1410	1412	1415	1419	1422	1427	1431	1434	1435	1437
17	**NEW COOLING TOWER**	**Proposed**											
19	**TREATED STP WATER**	**3"**	**19396**	**19401**	**19401**	**19413**	**19442**	**19452**	**19463**	**19464**	**19503**	**19527**	**19543**

Table 2: Water Flow Meters Measurement

TOTAL WATER CONSUMPTION AS PER FLOW METER READINGS, m^3

LOCATION	INCH	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb
WATER TOWER SOUTH COLONY	**6”**	24*10	19*10	16*10	18*10	17*10	15*10	22*10	19*10	19*10	15*10
WATER TOWER NORTH COLONY*	**6”**	5*10	5*10	5*10	5*10	2*10	3*10	10*10	7*10	3*10	5*10
AUTOPACKING OUTSIDE	**6”**	5	5	4	4	4	4	5	5	4	6
FILTER HOUSE	**2”**	17	14	14	16	18	20	15	16	10	24
COOLING TOWER	**3”**	20	20	21	20	21	24	20	21	19	20
ROLLER BASEMENT	**3”**	32	27	33	27	36	37	29	40	28	36
UNION OFFICE FRONT SIDE	**2”**	7	7	9	9	6	5	8	7	6	8
BATH WASH	**2”**	2	16	3	5	3	2	7	2	3	3
OUT SIDE CH-08	**2”**	-	3	1	1	-	1	-	2	2	-

"B" GATE TERRACE	**2"**	7	6	8	6	4	2	6	7	6	8
ROLLER TUMBLING	**2"**	2	2	3	4	3	5	4	3	1	2
TREATED STP WATER	**3"**	**5**	**-**	**12**	**29**	**10**	**9**	**1**	**39**	**24**	**16**
TOTAL	**-**	**240**	**190**	**160**	**180**	**170**	**150**	**220**	**190**	**190**	**150**
KNOWN	**-**	**92**	**100**	**96**	**92**	**95**	**100**	**94**	**103**	**79**	**107**
UNKNOWN	**-**	**148**	**90**	**64**	**88**	**75**	**50**	**126**	**87**	**111**	**43**

Table 3: Total water Consumption

SUMMARY OF WATER CONSUMPTION

- WATER TOWER NORTH COLONY* - Is not taken under production consumption.
- TREATED STP WATER** - Not considered under consumption since these are discharge values
- More consumption is observed at cooling tower,roller basement and filter house since these are the main operations in the company where there is more demenad for water.
- Outside ch-8 readings are inaqurate becose of its iregular usage of coolent system for ch-10.
- Due to improper functioning of flow meters following consumption areas are not been considered in calculating the total consumption which were considered in unknown consumption values in the above table
    - Canteen outside
    - South colony
    - Grinding basement(DGBB ch-2)
    - Grinding basement (F/OD)
    - Crate washing area
    - New cooling tower
- The treated water meter readings from ETP/STP shows that the company is not efficiently using the water treatment system.
    - The capacity of ETP is 150 m^3 current utilissation is 40 m^3
    - The capacity of STP is 200 m^3 current utilissation is 60 m^3. (Reason – due to internal leakages of oily water in to STP which)

6.4 STEP 4: CURRENT WATER STREAM MAP DEVELOPMENT

An updated water stream map was developed in company lay out as shown below. A clear difference between the old network which was being followed and new developed network was shown here.

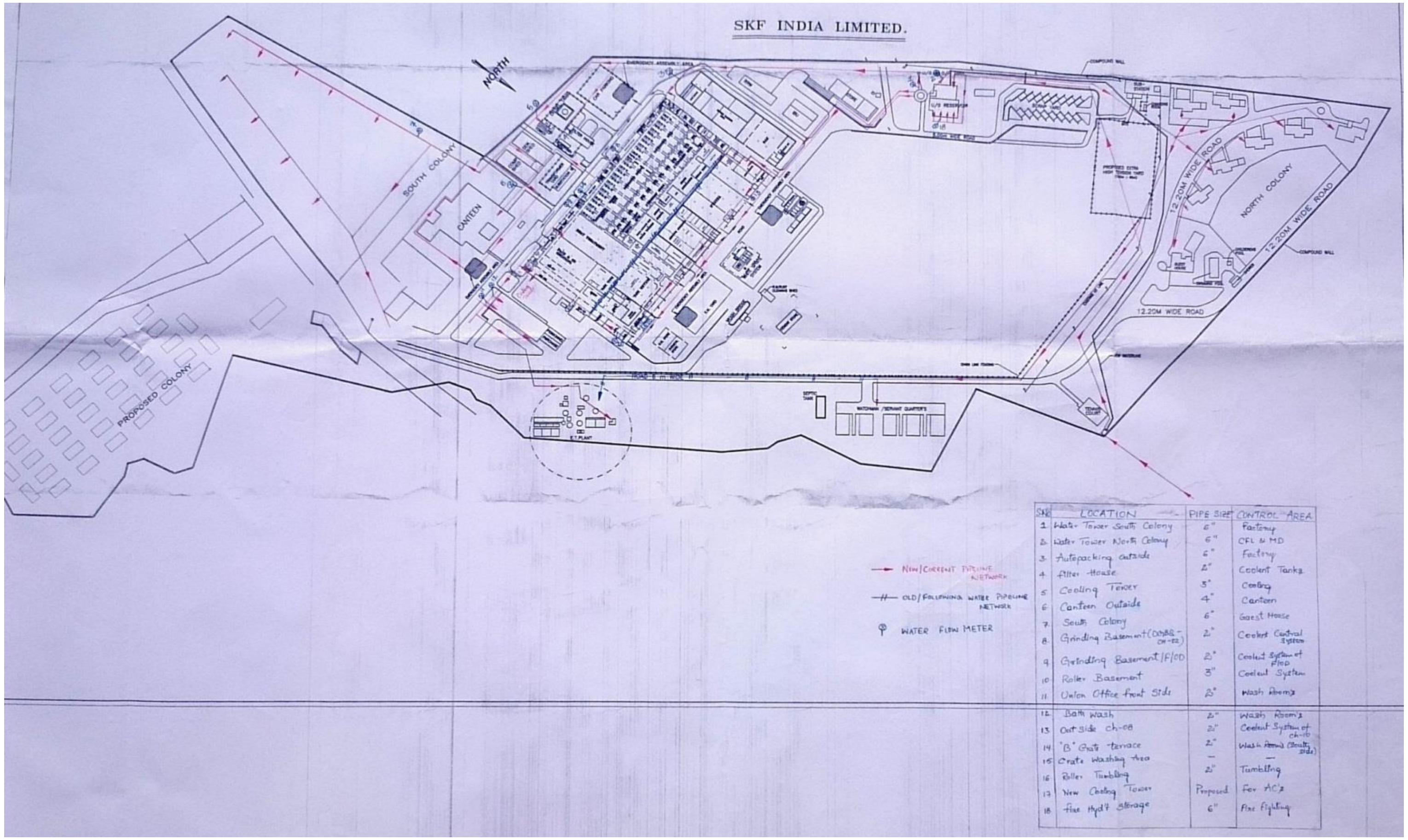

Figure 3: Layout of Current Water Stream Map Development

CHAPTER 7

CONCLUSION

- The development of water neutral concept resulted in finding out the functional gaps in achieving it.
- The water neutrality concept is explained to the best of the knowledge. The concept is applied to SKF India Ltd which manufactures various types of bearings.
- The possible availability,discharge/consumption of water in the industry are identified by taking flow meter readings in each and every unit.
- The consumtion of total water in the industry is summarized and it is being found that more water is being consumed in the areas like cooling tower, roller basement & filter house.
- The water network map is developed and necessary water flowlines are shown in the map.
- Suggestions are made to develop proper water balance inorder to achieve water neutrality.

“*The strength of the water-neutral concept partly lies in its positive connotation, which may trigger communities and businesses to act where otherwise they might not have done so. The strength of the water-neutral concept also lies in its link to the water-footprint concept.***”**

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